Ministry of Environment
Annual Report
1981/82

Ministry of Environment Annual Report 1981/82

Province of British Columbia

Ministry of Environment

Honourable Stephen Rogers,
Minister

B.E. Marr
Deputy Minister

VICTORIA, BRITISH COLUMBIA

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To the Honourable Henry P. Bell-Irving,
D.S.O., O.B.E., E.D.,
Lieutenant-Governor of
the Province of British Columbia

MAY IT PLEASE YOUR HONOUR

Herewith I beg respectfully to submit the Annual Report of the British Columbia Ministry of Environment for the period April 1, 1981 to March 31, 1982.

Stephen Rogers,
Minister of Environment

The Honourable Stephen Rogers,
Minister of Environment

SIR:

I have the honour to submit the Annual Report of the British Columbia Ministry of Environment for the period ended March 31, 1982.

B.E. Marr
Deputy Minister

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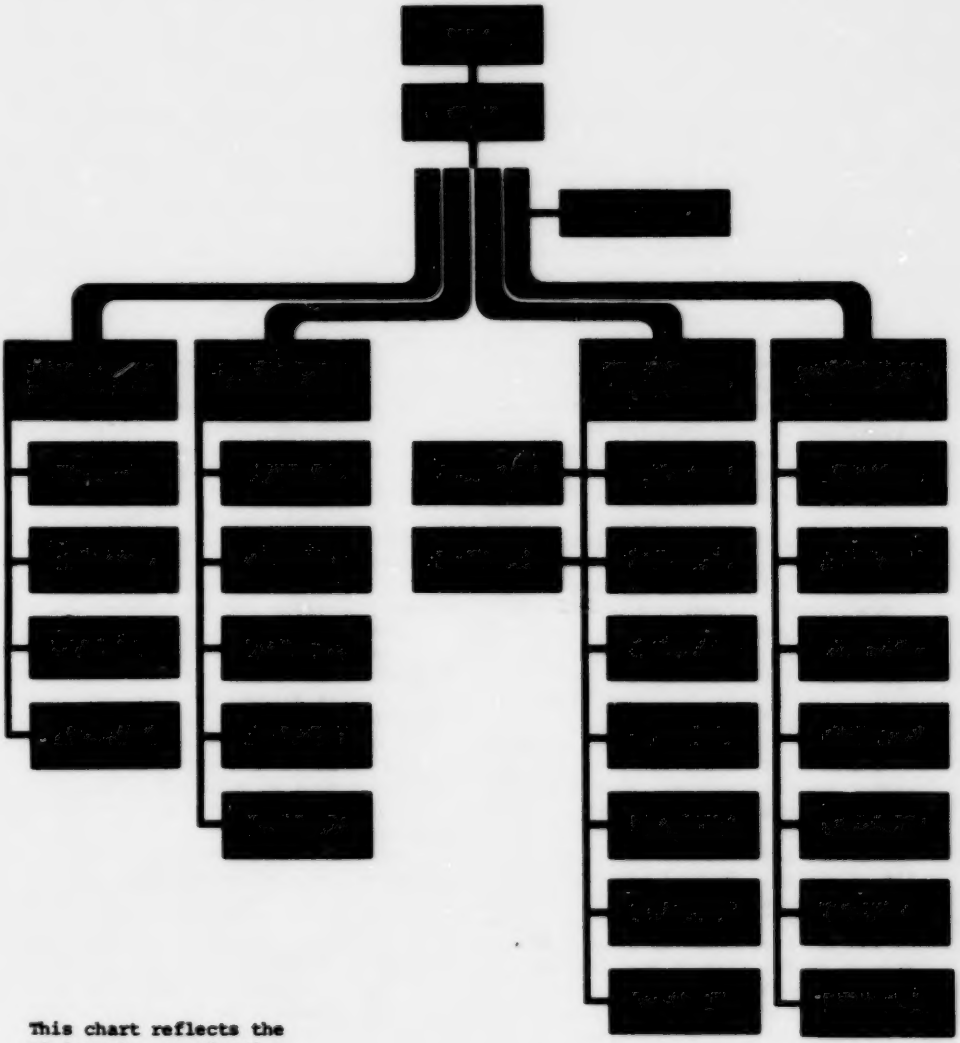
Ministry of Environment



This chart reflects the Ministry's organization effective May 1982.

Information Services

With organizational changes aimed at the broader ministry mandate for maintenance of "a quality environment for people, fish and wildlife", the priority for ministry communications became clear: broadly to promote the expanded role of the ministry and the ways in which individual issues fit into overall environmental management. With "Environment- It's Your Home" as a theme, the Branch set about to show how environmental issues and management affect and are affected by each of us, and how environmental protection is a responsibility that everyone shares.

This theme was pursued in a variety of ways, some highly visible, exemplified by the "Environments" poster series and television promotional spots. Less visible promotions included educational initiatives. Continuing activities, including the Ministry Mall display, reinforced this central theme.

Two other major initiatives, both consistent with this public orientation, began this year: the establishment of regional information officer positions in two regions, and the creation of a Minister's Awards Program for recognition of actions taken in support of the B.C. environment by both industry and public organizations. By year end, all these activities, and those listed below were established and prepared for continuation into the following year.

PUBLIC INFORMATION AND ENQUIRY

With public correspondence on a variety of issues contiuing at high levels, a number of publications dealing with key issues were developed to deal with these enquiries. Included among these were fact sheets on special waste treatment and siting, the trapping industry in B.C., acid rain, and synopses of Ministry legislation including the new Environment Management Act.

Information bulletins, 129 news releases and press advisories, a series of joint federal-provincial releases and features for community publications were issued. Press reaction was monitored through a clipping and evaluation service.

Some 1,500 pieces of information and regulatory signage were produced and installed for purposes ranging from wildlife warning signs to identification of Habitat Conservation Fund projects. Several outdoor interpretive displays were also included in these projects. In addition, Ministry displays were placed in a series of provincial and regional events, including the Sportsman Show, National Science Teachers Conference and the Provincial Food Fair in Vancouver and the Energy Show in Victoria.

"Wildlife Review" magazine underwent a number of design and editorial changes resulting in the inclusion of more original and specific management features. At the same time, the circulation system was shifted onto a computer base for more effective distribution control.

Ministry Identity

Pursuing the theme "Environment - It's Your Home" initiatives were undertaken to promote the broad Ministry mandate. A comprehensive "Guide to the Ministry of Environment" was published and distributed through displays at all ministry offices. The ministry poster series on the Environment theme was simultaneously extended by a further six subjects and distributed on request to all B.C. Government offices. In addition, the production and installation of cosistent signage and display elements for Ministry offices continued.

Five television and radio public service spots dealing with the theme of individual responsibility were prepared and distributed. Both sets encourage public enquiry and were supported by brochure material on the various topics covered.

The Ministry mall display, covering the topics of Waste, Water and Wildlife picked up the new theme and carried this message to eight Interior locations with appropriate exhibits and audio visual materials. The display was viewed during this period by an estimated 250,000 people.

A major publication entitled "British Columbia: This Favoured Land" was in preparation through a co-publishing agreement with a B.C. publisher during this period, and scheduled for release in the summer of 1982. The book deals with all aspects of the B.C. environment, and includes a series of original watercolour illustrations of native wildlife.

In December, the first awards under the Minister's Environmental Awards Program were made during a presentation ceremony at Government House. Recipients of the principle awards were the Fraser River Coalition and the Burrard Clean Oil Spill Co-operative for the public and industry categories respectively.

EDUCATION PROGRAMS

With the designation of Encore, the ministry's primary environmental education package, as prescribed curriculum for B.C. schools, attention turned toward its implementation in the school system and also to the development of new waste management material. A number of in-service presentations were made in regard to the former, and an educators' advisory group was struck for the latter. By the end of the fiscal year the program outline was established for the waste management package and one component was in preparation for inclusion in the new Consumer Fundamentals course to be introduced by the Ministry of Education. A program on this same theme was prepared for presentation on the "Knowledge Network" system and the series of workshops with environmental educators was continued.

The Conservation and Outdoor Recreation Education (CORE) program was continued through this period, with the new Wildlife Act and a stricter hunting licence issuance system expected to produce greater pressures on CORE to accommodate more students in the coming year.

To prepare for this increase, steps were taken to improve both the quality and availability of the program Contracts were awarded to the Ministry of Education tc reconstruct the instructors lesson plans, and to the B.C. Wildlife Federation to study the feasability of introducing a practical onrange fire arms training exercise in association with CORE. Also, arrangements were completed with the Open learning Institute to develop a new distance learning program for CORE.

The number of courses (425) and number of students (10,944) were up about 10 percent in 1981 over the previous year. More than 80 percent of students taking CORE did so in order to qualify for a hunting licence. For more details, see the table on page 7.

STAFF COMMUNICATION AND SERVICE

"Environment News" continued to be the primary means of staff communication in the ministry with four issues in this period and a shift to regional coverage. At the end of the fiscal year plans were in place to broaden the tabloid to reach outside audiences including special interest groups.

A major audio-visual program on the structure and responsibilities of the ministry was prepared as a companion to the new ministry directory, and distributed to ministry office for both staff orientation and for use in presenting the ministry to local audiences.

Publication design, editorial and production services were provided to most Ministry program areas as new design standards and approval requirements took effect. In this respect, Information Services Branch became the primary contact for all ministry programs in the areas of media contact and print production. Photographic coverage was extended to a number of areas, including snow survey operations, the conservation officer service, aquatic studies activities and the coastal/ estuary area. Coverage was also given to special events, including the Mount Terry Fox ceremonies, B.C. Place, the Minister's Environmental Awards ceremony and the openings of several environmental facilities.

LIBRARY

The library has become more widely recognized since its amalgamation, and demands for service have increased as service to the regions expanded with staff visits to organize the local collection and explain library capabilities. With more current awareness services being offered, the demand for interlibrary loans, orders, and computerized reference searches has more than doubled over the previous period.

A computer-produced catalogue of holdings was produced in both print and fiche form, as well as a listing of periodicals held by the central library.

Liaison work with Ministry employees and other librarians in the Pacific Northwest area continued and resource sharing of publications and information became increasingly important.

In addition to regular loan services, interlibrary loans averaged 160 per month during this period and requests for article reprints from circulated tables of contents averaged 650 per month. Over 100 computer searches were made during this same time.

Administration Division

General Administration Program

The General Administration Program provides executive direction, control and coordination services for the Ministry as well as information, personnel, finance, systems, space, communications and general administrative services in support of the Ministry's operations.

FINANCIAL SERVICES BRANCH

In accordance with the Ministry's decentralization policy, the Branch continued to delegate certain accounting and reporting functions to branches and Regions. Extensive monitoring and training programs were carried out by the Branch, with the result being that cheque vouchers and financial reports are prepared mainly by the branches and Regions. Approximately 32,593 cheque vouchers were produced and the error rate was reduced to less than one percent.

The new Financial Administration Act presented the Ministry with a more comprehensive set of standards for financial control. Financial Services Branch issued its own Policy and Procedures, in the Ministry format, and a start was made on implementation of new policies and procedures.

Treasury Board released a Budget and Administrative Policy Manual and the Ministry utilized the computerized Interactive Estimates System for 1982-83 estimates, with positive results.

The increased emphasis in financial management responsibilities necessitated changes to the Branch. Two new positions were approved and designated as Manager, Policy, Systems and Procedures, and Manager, Revenue.

PERSONNEL SERVICES BRANCH

Personnel Services Branch provides services to the Ministry in the fields of recruitment and selection, salary administration, classification, organizational analysis, contract administration, collective bargaining, employee relations, staff development and safety, manpower planning and records administration.

The Ministry was selected as one of four to receive delegation for recruitment and selection from the Public Service Commission and also classification responsibility from the Government Employee Relations Bureau.

There was increased activity in the number of appeals on Ministry competitions; however our frequency of appeal was generally lower than that of other Ministries.

The major Ministry reorganization undertaken over the past two years resulted in a significant amount of organizational analysis and classification analysis. By the end of the fiscal year, the organizational analysis was largely complete, but a second Ministry Classification Committee created to handle the heavy volume of the classification activity.

Reorganization caused the necessary relocation of a number of employees and their positions. Special placement consideration was given to employees who refused to relocate, with the satisfactory placement of 26 of 44 (59%).

An extreme shortage of professional engineers was experienced by the Ministry. Cross-Canada advertising campaigns and a University recruiting program enabled the Ministry to staff the majority of engineering vacancies.

The Staff Development and Safety Section prepared a new staff development policy, safety policy, and procedure for applications as the foundation for improved effectiveness in the management of the Ministry's human resources. A data storage and retrieval system on staff development activities and costs was designed into the application system to enhance management monitoring and decision making. Following a Ministry-wide training needs assessment, priority programs were presented on important aspects of Ministry functions, including safety.

A DACUM job analysis was conducted on three positions which will enable a more systematic approach on training needs assessment, organization analysis, classification, performance appraisal and staff development activity design. A quarterly training calendar for Ministry-wide distribution, described staff development activities available to Ministry employees.

CONSERVATION OFFICER SERVICE

Conservation Officers in British Columbia enforce the following statutes:

Environment Management Act
Wildlife Act
Firearm Act
Fisheries Act (provincial)
Litter Act
Pollution Control Act
Water Act
Motor Vehicle (All Terrain) Act
Migratory Birds Convention Act
Federal Fisheries Act
Game Export Act

A total of 2,322 reports were received from the public concerning possible violations under one or more of these Acts, and a total of 2,000 violations were found in the field by Conservation Officers. Court proceedings were undertaken in 1,902 cases and convictions were obtained in 1,368 cases or 72%. Warnings were issued in 1,040 instances and 925 cases remain unsolved. A total of $142,045 in fines was levied.

The Ministry received 4,900 complaints from the public about nuisance or dangerous animals.

WILDLIFE MANAGEMENT

Acts enforced:

Wildlife Act
Firearm Act
Migratory Birds Convention Act
Game Export Act

Conservation Offiers spent 68% of their operational time on wildilife enforcement and management duties.

There were 1,615 reports from the public of possible violations and 1,369 violations were found by the Conservation Officers while on patrol. Court proceedings were instituted in 1,124 cases or 76%; 684 warnings were issued and 759 cases remained unsolved. A total of $75,669 in fines was levied.

Conservation Officers responded to 1,338 of 4,900 complaints from the public concerning nuisance or dangerous wildlife, broken down as follows:

	Complaints Received	Acted On
Black Bear	2,053	801
Grizzly Bear	121	41
Cougar	250	77
Wolf	323	141
Other	2,153	328

FISHERIES MANAGEMENT

Act enforced: Federal Fisheries Act.

Conservation Officers spent 23.5% of their operational time on fisheries and habitat protection duties. Five hundred and seventy-six reports were received from the public concerning possible violations and 513 violations were found by Conservation Officers while on patrol. Court proceedings were instituted in 331 cases and convictions were obtained in 210 instances or 63%. A total of 323 warnings were issued and 135 cases remain unsolved. A total of $39,135 in fines were levied.

WASTE MANAGEMENT

Acts enforced:

Pollution Control Act
Environment Management Act
Litter Act

Conservation Officers spent a total of 2.85% of their operational time on the enforcement of waste management legislation. Eighty-three complaints were received from the public and 64 violations were found by the Conservation Officers while on patrol. Court proceedings were instituted in 47 cases and 20 resulted in convictions or 42.5%. Warnings were were issued in 20 cases and 23 violations remain unsolved. A total of $13,250 in fines were levied.

WATER MANAGEMENT

Act enforced: Water Act

Conservation Officers spent a total of 0.32% of their operational time on enforcement of the Water Act. Nine public complaints were received of possible violations under this Act and 8 violations were found on patrol. Court proceedings were entered in 10 cases and four convictions were

obtained or 49%. Warnings were issued in two cases. A total of $1,000 in fines was levied.

In the course of their duties, conservation officers lay charges under other Acts including the Criminal Code. During 1981/82, 39 charges were laid under other Acts, resulting in 10 convictions (25%) with $13,000 in fines being levied.

Conservation Officers spent 6,340 man hours on community information and education related activities, an increase of 550 hours (9.5%) over the previous year.

CENTRAL SERVICES

Following the appointment of a Manager, Central Services continued to provide services to the Ministry in the areas of space, telecommunications, vehicle insurance, acquisition and inventory, furnishings and warehousing, and mail room and courier service.

Specific accomplishments included the provision of space for approximately 1,500 personnel, the completion of new buildings in Smithers, Penticton and Kamloops and the start of construction of a regional headquarters in Williams Lake. Preliminary work on a new Environmental Laboratory commenced.

In the field of telecommunications service, 160 requests were processed, including three for Mitel SX 200 Switchboards and the necessary circuits to accommodate electronic mail service was the publishing of a Ministry-wide Postal Address and Telephone Directory.

Nine new or replacement vehicles were obtained and requests were processed for the lease of 50 rental units, and insurance was obtained for each vehicle. In Victoria a "pool" of vehicles was organized, and one position was added in support of this activity.

A Policy and Procedure was implemented for the procurement and use of 450 Ministry boats.

COMPUTING SERVICES BRANCH

Computing Services Branch continued to provide cost beneficial computing, word processing and system services to the Ministry in support of the Ministry's programs.

During the year several significant achievements were accomplished. These included the installation of word processors in regional offices, the initiation of electronic mail between the Regions and Victoria, and the installation of a microcomputer in the Nanaimo Regional Office. In the field of mapping, an IGDS Computer Mapping System was installed and a Computer Graphics Coordinator hired.

The Ministry Policy and Procedures Manual was implemented. A plan was prepared to bring each Computer System under release control, and the position was developed with B.C.S.C. that microcomputers are appropriate for Ministry work in certain situations.

REGIONS

Regional Offices took over several functions which had formerly been the responsibility of headquarters-based branches.

Functions transferred included processing of accounts, with cheque vouchering from Financial Services, water licences from Water Management, waste permits from Waste Management and monthly financial statements.

Additionally, Regions implemented a Ministry file system, electronic mail and word processor facilities.

Throughout the regional offices, needs assessments took place, with the result being shifts of assignments and streamlining of procedures to ensure maximum staff efficiency.

Several Regions were involved in moves of staff into new buildings in Smithers, Penticton and Kamloops, and interim space was provided in Nelson.

Specific accomplishments, within Regions, were:

FINANCE:

Expenditure reports were semi-automated through the use of the word processor. Permanent accounts clerks were hired and trained and the accounts files were reorganized.

PERSONNEL:

Administration staff supervisors were appointed for administration, word processing and licence processing. The personnel files were brought up-to-date, position files were created, leave management records completed, and a skill inventory profile was undertaken. Word processors were used to store personnel records, form letters and to produce salary projections.

Status reports and organization charts were provided regularly to management.

SUPPORT SYSTEMS:

Constant revision of administrative systems was undertaken to gain efficiencies through use of word processing, and its utilization and the long term staffing. File systems were revised, secretarial workloads adjusted and office space requirements reviewed. A first-aid room was equipped and a staff member trained in industrial first-aid. In Nanaimo vehicles were replaced and added to the regional fleets and an additional photo copier was installed in the Nanaimo office at no additional expense.

LICENCE PROCESSING:

Draftspersons and Senior Processing Clerks were appointed and trained to undertake the decentralized function of licence processing in all regions.

SPACE:

Accommodation in the form of improved office space was provided in several Regions. Chilliwack and Cloverdale District Offices (Lower Mainland Region) were moved, Kamloops/-Thompson Nicola/Cariboo staff were relocated in a new building and in Williams Lake, Waste and Water staff were moved, improvements were made in the storage facility and planning and layout for a new consolidated facililty was completed. In Nelson (Kootenay Region) an interim space plan was accepted and in Penticton (Okanagan Region) staff were centralized in a new regional office.

OTHER:

Omineca-Peace Region had a unique involvement with the start-up of the North East Coal Development. This involved purchase of vehicles, equipment, hiring of auxiliary staff and the development of office space to accommodate the necessary staff in Fort St. John.

All Regions took preliminary steps to implement a Ministry-wide filing system.

Environmental Management Division

Fisheries Management/ Wildlife Management Programs

ADMINISTRATION

The scale of hunting and angling licences generated about $7,000,000 in the fiscal year 1981/82, an increase of 2 1/2% over the previous year, and a reflection of the still-growing involvement in hunting and fishing by residents and non-residents alike (Table 6.11).

On October 1, 1981 an impost was added to all basic licences (except Senior Citizen licences) to develop revenue for a special Habitat Conservation Fund for the enhancement and management of designated wildlife lands. During the part-year of its operation, $183,000 was received and earmarked to the Fund. An advance of $750,000 was made to the Ministry as start-up capital, to be repaid from revenue received in subsequent years.

Expenditures in fish and wildlife management and protection totalled $14,212,000, not including overhead services of utilities, accommodation and computer services.

The Creston Valley Wildlife Management Authority disbursed $144,615 in management activity in that special wildlife area, while the Habitat Conservation Fund handled approved projects valued at $711,500, of which 15 were Wildlife, 7 Fisheries and 3 Administrative. The provincial component of the Salmonid Enhancement Program beneficially spend $2,000,000. The full appropriation made to this federal/provincial cost-shared activity. A figure in excess of one half million dollars was provided by B.C. Hydro under agreement with the Ministry to mitigate or compensate for wildlife and fishery values affected by major generation projects.

Guided Hunting generated approximately 18.5% of the total Fish and Wildlife revenue to the province. Guide outfitters provided guiding services to 4057 hunters. Of these guided hunters, 23 were British Columbia residents, 116 were Canadian non-residents and the balance in 23 other countries. There were hunters from every state of the United States. These hunters harvested 3,590 game animals. See Table 6.5.

Active guides numbered 275 (out of 299 licences held) and there were 723 active assistant guides (1187 licences held). 121 small game and angling guides were licenced.

Wildlife Program

The primary goal of the wildlife program is to maintain the wildlife species of the province in sufficient abundance to meet the social, recreational, ecological and economic needs of society. Wildlife management activities include inventory and management of wildlife populations, maintenance and enhancement of habitat, and regulation of hunting and trapping harvests.

On April 11, 1981, a White Paper and draft legislation revising the Wildlife Act were released. The many submissions received from individuals and organizations were examined in detail and many of the public's suggestions were incorporated into the Bill covering the revised Act.

The last of 27 preliminary Wildlife Species Management Plans for British Columbia was completed in 1981. Progress continued on preliminary Regional Management Plans.

Game Farming

In August 1981, a discussion paper and questionnaire on a proposal for trial game farming in British Columbia was distributed to interested organizations throughout the province. Seventy-five percent of returned questionnaires indicated opposition. A Gallup poll early in 1982 indicated a small majority of residents of the province approved of a trial program under government supervision, but demonstrated that little interest in the purchase of game meat existed within the province.

In view of the strong opposition

from groups most concerned with wildlife, and general lack of demand for game farming among the general public, the Ministry decided not to proceed.

Caribou

Caribou populations have declined in most of British Columbia, particularly throughout their southern range. Woodland Caribou in the mountains of southern British Columbia are dependent on lichen-bearing coniferous forests that reach their highest value for the animals when the forests are overmature from the forester's point of view. This places caribou management in direct conflict with traditional forest management directed toward a maximum sustained crop of wood products. In February, 1981 the Ministry of Environment and the Ministry of Forests established a task force to analyze the problem and present a series of options for a policy decision on the trade-offs between maintaining cariboo and harvesting high elevation old growth timber.

Grizzly Bears and Coastal Development

Field work began in the spring of 1982 on a three to five year research project on coastal grizzly bears, in cooperation with the Ministry of Forests, primarily to assess the impact of forestry activities on the bears and their habitat. The study area is the Kimsquit Valley, about 450 km north of Vancouver.

Vancouver Island Old Growth Forest Study

A one-year study of problems involving the interaction of deer and elk with mature forest has been initiated on northern Vancouver Island. A cooperative venture with the Ministry of Forests, the study will concentrate on identifying ecological and economic factors which affect timber and ungulate production and the interactions between these factors which result in allocation problems. The economic impact of removing timber from the Annual Allowable Cut, as well as the public demand and expectations for deer and elk, will be identified.

Problem Wildlife

Livestock losses attributed to predators have declined marginally since 1979. See Table 6.19. The decline was most pronounced in wolf related losses, possible reflecting increased wolf control activity. During 1981, 162 problem wolves were trapped, shot, or took 1080 baits, an increase of 190% over the number destroyed in 1979.

There was no significant change in losses of livestock to coyotes and bears. The majority of bears dealt with were removed because they endangered human safety and property, rather than because of a threat to livestock.

Livestock losses to cougar have increased since 1979 but are low compared to losses to the other large predators. Most requests for cougar control result from concern for human safety.

In the East Kootenay, Limited Entry Hunting had restricted success as a means of increasing the harvest of non-migrating elk. This resulted in complaints from farmers and ranchers.

A new Problem Wildlife Management Committee was established in the West Kootenays in 1981, primarily to deal with deer/elk/orchard problems near Creston. Representatives from the Fish & Wildlife Branch, Ministry of Agriculture, conservation and agricultural organizations cooperated to patrol the orchards at night. Extending the hunting season helped protect the orchards as well, more as a harassment than as a result of increased harvest of the wild ungulates.

On Vancouver Island two habitat enhancement projects are expected to provide a measure of relief from agricultural damage by elk. A special hunting season has already eased the situation there.

Deer damage in Okanagan orchards was low in 1981/82, but remains a potential problem. Range enhancement programs that will improve forage and lure deer away from the orchards are expected to contribute to a long term solution.

No serious economic damage from waterfowl was evident in 1981. Damage levels were low in the Lower Mainland, the principal area for waterfowl problems.

Trapping

Further initiatives were taken to promote humane trapping. Following release of the report of the Federal/ Provincial Committee on Humane Trapping in 1981, British Columbia announced that use of leg-hold traps will be greatly restricted. It is expected that land trap sets using the leg-hold trap as a holding device will be eliminated by the fall of 1982 if practical alternatives are available. Modified leg-hold traps will continue to be allowed for the capture of canids and felids.

Habitat Management

During the 1981/82 fiscal year the mandate of the Habitat Protection Section was broadened to include the development of habitat for the fish and wildlife resources of British Columbia.

Low Flow Methodology

The Section developed and field tested a procedure to estimate loss of fish production associated with a decrease in stream flow. Such losses can occur as a result of demands from industry, agriculture, or urban expansion.

Carnation Creek Study

The Habitat Management Section was involved in studies of the changes in water temperature associated with timber harvesting in the Carnation Creek basin. The study revealed that in the coastal stream, both mean monthly temperatures and the range of daily temperatures in summertime increased in proportion to the amount of streambank cleared. Slash burning led to further increases, however, suggesting that clearing of streamside vegetation is only one factor of several affecting stream temperature.

Habitat Handbooks

Work has begun on a cooperative project with the Ministry of Forests to develop habitat handbooks that will aid wildlife and forest managers in planning for wildlife habitat.

Pesticide Permit Referrals

Over 350 applications for pesticide use on public lands were reviewed by the Habitat Management Section as a member of the Pesticides Control Committee. Review included pre-treatment inspections on-site, followed by recommendations to the Pesticide Control Branch.

Land Administration

Leasing arrangements with the National Second Century Fund of British Columbia continue to flourish. Long term (99 year) management rights were acquired on nine properties totalling 670 hectares during 1981/82. Habitat for elk, waterfowl, upland game birds and fish was included in these properties.

Public Conservation Assistance Fund

The Public Conservation Assistance Fund ($50,000 annually) assisted fifteen conservation projects. The Fund provides half the total cost, with project volunteers supplying materials, equipment, labour or additional financing of equivalent value.

Some of the 1981/82 projects involved tagging and monitoring of elk in the Nanaimo River watershed, construction of an outlet screen at Rossmore Lake, provision of viewing stations and signs at sanctuaries, construction of facilities for care of injured wildlife, wood duck rearing, aeration and rehabilitation of Logan lake fishery, construction of incubation boxes and gravel spawning platforms in Canoe Creek, publishing books on local birds in Langley, improvement of a natural water area near Kamloops, feeding California bighorn sheep, and stream channel clearance in the Little Chilliwack River.

Kemano Completion Project

The Section coordinates the Ministry's review of Alcan's proposed Kemano Completion Project, and is participating with the Department of Fisheries & Oceans, International Pacific Salmon Fisheries Commission and Alcan, in the Joint Alcan Technical Committee. Set up subsequent to the 1980 Supreme Court injunction requiring release of sufficient water into the Nechako River for salmon Spawning, the committee facilitates communication and exchange of technical data.

Site C Hydroelectric Project

A major report was completed in cooperation with the Assessment and Planning Branches outlining concerns for fish and wildlife in connection with the Site C Project. A program of compensation for damages was prepared.

Revelstoke Dam

An agreement was signed between the Ministry and B.C. Hydro to provide $6 million compensation for loss of fish and wildlife habitat resulting from construction of the High Revelstoke Dam. This is the largest compensation settlement of this kind to date in British Columbia.

Kootenay Diversion

The Habitat Management Section is coordinating the Ministry's review of the Kootenay Diversion Project.

Hat Creek Thermal Generation Proposal

The Section has been actively involved in review of B.C. Hydro's preliminary environmental impact statement on the Hat Creek proposal.

Fish/Forestry Interaction Program

A five-year intensive research project sponsored by the Ministry of Environment, Ministry of Forests, and the Department of Fisheries & Oceans entered its second year. The purpose is to assess and document the impact of landslides on stream environment, fisheries, and forest resources on the Queen Charlotte Islands. The program will be active until 1985/86.

Habitat Conservation Fund

A variety of activities were initiated under the auspices of the Habitat Conservation Fund. This fund was established to acquire and enhance key areas of fish and wildlife habitat in British Columbia.

Habitat Acquisition Account

Four properties totalling 600 hectares were purchases, four more about 600 hectares in size were in the negotiation stages, and several have been identified for purchase. The sum of $2.5 million dollars has been earmarked for the purchase of habitat for fish and wildlife conservation purposes in the last two years; $1.26 million in 1980/81 and $1.24 million in 1981/82. This money is granted from the Crown Land Fund-a fund fed by proceeds from the sale and development of Crown land.

Habitat Enhancement Account

A $3.00 surcharge added to hunting, fishing, trapping and guiding licences was initiated on October 1, 1982.

Twenty-seven habitat enhancement projects were completed using an advance of $750,000 against surcharge revenue. Projects included the application of prescribed fire, the construction of spawning channels, wetland manipulations, fencing, lake aeration, placement of gravel to improve trout spawning, thinning, planting of grass and browse species, and stream clearance. Projects were completed in all eight regions of the province.

Other Regional Activities

On Vancouver Island deer carryover and population surveys continue to follow similar trends over the past six or seven years. In the south, where there are low wolf densities, deer populations are increasing; in the north, with high wolf densities, deer populations continue to decline, despite a succession of mild winters. Wolf/deer interaction research was continued through 1981. A proposal to initiate an experimental wolf control project was submitted.

The most active Vancouver Island regional wildlife projects were associated with the Integrated Wildlife/ Intensive Forestry Program, designed to provide the information required to allow effective integration of wildlife requirements and intensive forest management. Baseline information on elk and deer movement and habitat use is being gathered.

In Region 2, the Lower Mainland, assessments of moose habitat in the Elaho River valley and deer habitat on Texada Island were carried out. With assistance from the B.C. Institute of Technology, a small project to monitor movements of black bears in garbage dumps in the North Vancouver area was initiated. Habitat enhancement and other improvement projects were carried out in the Serpentine, Addington Marsh

and Pitt Wildlife Management Areas.

A number of new groups involved with urban recreation were established in Region 2, including several municipal firearms bylaw committees, the Lower Mainland Hunters Council and the Squamish Estuary Conservation Society.

Indicative of the heavy load of interagency referrals experienced throughout the province, the Lower Mainland habitat protection section processed 1761 referrals in 1981/82, as follows:

Timber Sales - 228
Timber Harvesting Licences - 59
Timber Sale Licences - 25
Timber Licences - 8
Timber Berth - 2
Special Use Permits - 29
Right-of-Way - 15
Mineral Exploration - 54
Placer Leases - 18
Culverting, Channeling - 18
Subdivisions - 544
Dyking - 19
Dredging - 17
Land Leases - 149
Pipelines & Crossings - 35
Landfills - 6
Marinas - 14
Water Rights - 150
Water Licences - 137
Waste Management - 138
Bridges - 23
Storm Sewers - 14
Miscellaneous - 45

All regions experienced similar involvements, in both variety and numbers. In the Thompson-Nicola Region, for example, the staff participated in planning and inventory for the deferred planning area, strategic planning, operational planning, folio planning of the Stein River, Spius Creek and Nehalliston, Clinton Land planning, and 'Core Land' planning. Mapping of winter range for caribou was presented to the Forest Service for inclusion in a 10,000 hectare reserve adjacent to Wells Gray Park.

In the Kootenays, Habitat Conservation Fund projects included preparation of a detailed plan to secure and enhance the critical wetlands of the upper Columbia River, initiation of a long term program to enhance Rocky Mountain bighorn sheep populations and enhancement of wildlife habitat on the Duncan-Lardeau River delta.

In the Cariboo cooperative studies to determine a method of logging mature Douglas-fir least detrimental to mule deer, and to determine effects of logging on grizzly bear, were begun.

Wildlife management staff in the Skeena region completed a total revamping of the species regulation and harvest levels for Region 6, participated in a moose tracking study with Northwood Pulp, conducted an extensive caribou survey and carried out many other functions to protect and enhance wildlife populations in their region.

Region 7, Omineca-Peace, added two positions to deal with North East coal development, and one pipeline biologist. A major report on moosetrain mortality was prompted by weather conditions in January, 1982 that resulted in large numbers of moose and some cariboo being killed by trains.

In the Okanagan Region mule deer habitat was acquired at Antlers Saddle, and 1,000 hectares of range was burned over in Ashnola to improve forage for California bighorn sheep. A breeding survey on deer was begun.

Fisheries Program

The primary objective of the fisheries program is to protect, maintain and enhance our native fish stocks for the benefit of the increasing number of freshwater anglers and those who wish to observe fish in their natural environment.

In the 1981/82 sport fishing season, approximately 365,686 resident and 109,810 non-resident angling licences were sold. This reflects a steady increase in the number of sport fishermen in British Columbia by about 4% per year over the past 20 years. Today provincial lakes and streams receive three times the demand from anglers that they did in 1960 but the catch has remained static at eight million fish annually. This means a decline from four fish per angler day in 1960 to 1.5 fish per angler day in 1980, emphsizing the need for immediate action to improve our fisheries resource.

The Fisheries Research Section conducts detailed experiments to test the feasibility of enhancement techniques. Methods, results and cost/benefit analyses are made available to fisheries biologists for use in appro-

priate situations.

The Fish Culture Section implements the provincial fish stocking program in lakes and streams. Hatchery fish introductions help to enhance severely depleted wild fish stocks and establish sport fish in barren lakes to maintain or increase angling opportunities. Approximately 17.5 million trout, char and salmon eggs were collected in 1981. A total of 7.1 million hatchery fish, weighing 58 metric tons, were released into 681 lakes and 40 streams in the province.

About 3,260 fish were examined for infectious diseases in a continuing program to monitor fish health in all provincial hatcheries, as well as in all adult fish used for egg collections.

The Fish Habitat Improvement Section staff provide detailed scientific and technical advice to the Ministry, other government staff and outside agencies regarding mitigation and compensation alternatives. They conduct extensive evaluations of fish habitat and make recommendations for improvement. They carry out cooperative improvement projects with regional staff, other government agencies, industry and the public. In 1981-82, Fish Habitat Improvement biologists and technicians were involved in 17 projects within the Salmonid Enhancement Program and 15 inland (or non-anadromous) fisheries projects.

Additional functions of the Fisheries Management Section include the development of the Non-Tidal Sport Fishing Regulations Synopsis and regulation of private sector fish culture facilities. Funding for many projects was derived from the Habitat Conservation Fund, Public Conservation Assistance Fund, Okanagan Basin Implementation and Salmonid Enhancement Program.

Habitat Conservation Fund

In 1981-82, money from the Habitat Conservation Fund was provided to acquire land adjacent to:

1. A flood-prone area of Redfish Creek which is an important spawning area for kokanee in the west arm of Kootenay Lake.
2. The Stellako River to preserve a natural setting for trout fishing and the viewing of spawning salmon.

Seven projects to improve or create fish habitat and enhance local sport fish populations were also funded:.

1. Construction of a small spawning channel on Redfish Creek for kokanee salmon in Kootenay Lake.
2. Aeration of lakes in the Kamloops district to eliminate winter kill of fish (three were operating in 1981 and three more will be functioning next year).
3. Reduction in the number of sculpins that compete with rainbow trout populations in Beaver Lake near Vernon.
4. Addition of spawning gravel to the outlet stream of Weaver Lake near Chilliwack.
5. Improvement of rainbow trout spawning habitat and to provide access to tributaries of 12 lakes in the Chilcotin-Cariboo.
6. Chemical rehabilitation of Chain Lake near Princeton to eradicate peamouth chub and find scaled suckers.
7. Extension and improvement of the existing spawning channel at Whiteswan Lake near Canal Flats.

Salmonid Enhancement Program

The Federal/Provincial Salmonid Enhancement Program started in 1977 to preserve, rehabilitate and/or enhance Pacific salmon, steelhead and sea-run cutthroat. The program is divided into two stages. Phase I will continue until 1983/84 as a development stage, while Phase II is production oriented to meet long range objectives.

The experimental rearing of the steelhead trout to smolt size in net pens is proving successful as the first substantial numbers of adults return to the Keogh River. In 1981, 13,500 pen reared smolts were released with an expected release of 30,000 more smolts in 1982.

Stocking fry in the headwaters of streams that are barren of fish due to natural barriers is being examined to test the feasibility of this method for the enhancement of steelhead stocks. This year has been the fourth of a proposed five year study.

Sea-run cutthroat smolts were released again in 1981 in Hope-Camp Slough, a side channel of the Fraser River. Flood conditions prevented the proper evaluation of fish migrations,

but anglers indicate that these cutthroat have strayed considerably through the lower Fraser River.

Information is being acquired on the interception of steelhead trout in the Pacific salmon commercial fishery. Particular fish stocks can be identified by examining the enzymes present in liver and muscle tissue. This method is being used to pinpoint steelhead runs that may be jeopardized by the commercial fishering and, thus, to aid fisheries biologists in developing management plans.

Stream fertilization through the addition of nutrients to the water contributes to the growth of steam algae and bacteria. Aquatic insects feed on the bottom growth and in turn provide food for fish. Research was conducted on the Keogh River to determine the beneficial effect on fish growth and production.

Production of anadromous cutthroat and steelhead has increased significantly since the commencement of S.E.P. in 1977. About 465,000 sea-run cutthroat and steelhead, and 55,000 chinook salmon were released into 27 streams in 1981. These fish were raised at Fraser Valley Hatchery (Abbotsford), Loon Creek Hatchery (Cache Creek) and five off-site rearing facilities situated on Vancouver Island and the Lower Mainland. Construction of the S.E.P. Vancouver Island Hatchery was nearing completion in March 1982. This facility will be used to hold adult steelhead and cutthroat for egg production and rearing of fry. Plans are to stock eight streams on Vancouver Island with these fry.

Many rivers on Vancouver Island are suffering from declining fish stocks, particularly of summer-run steelhead. An intensive fish culture program was incorporated to collect and fertilize steelhead eggs from various rivers on the Island and incubate them at federal hatcheries (Big Qualicum, Quinsam, Rosewall and Robertson Creek). In 1981, steelhead fry were stocked in underseeded areas of the Little Qualicum River and Cameron Lake as well as in the headwaters of the Quinsam and Salmon Rivers. One year old smolts were released in the Big Qualicum, Chase, Millstone, Englishman, Quinsam and Somass Rivers.

The first release of pen reared steelhead smolts into the Cowichan River was in the spring of 1981. A new program to raise Tsitika River summer-run steelhead in net pens at O'Connor Lake began as well. These smolts will be introduced into the Campbell River in May, 1982 to re-establish the summer-run fishery.

The planting of sea-run cutthroat fry and smolts in six creeks and rivers on Vancouver Island provided excellent angling in saltwater bays and estuaries. A successful fishery in the Gorge waterway in Victoria resulted from smolt releases into Colquitz Creek. This stocking program will continue next year.

The Fraser Valley Hatchery is the site for the incubation and rearing of steelhead to be stocked in the Lower Mainland. In addition, Inches Creek Hatchery and rearing ponds in Surrey produced cutthroat and steelhead smolts. Loon Creek Hatchery released 50,000 chinook salmon dry into the chinook salmon dry into the Bonaparte River. In 1982, this number is expected to be more than doubled. One year old steelhead juveniles were also released. For the first time, a trap on the Bonaparte River was used to capture steelhead adults for egg collections. The usual method of capture was angling.

This Salloomt River, a tributary of the Bella Coola River, was stocked with steelhead fry as the start of a five year program. A barrier will be removed prior to adult returns, providing access to new spawning and rearing habitat.

A pilot hatchery on the Chilcotin River was developed to incubate eggs for 14,000 steelhead fry that were released in the Chilko River. The upper Zymoetz (Copper) River received 100,000 steelhead fry in 1981. Alternate year stocking will schedule the next Zymoetz fry plant for 1983.

The assessment of fish habitat prior to any enhancement work is necessary to determine the most efficient and effective method of benefiting fish populations. In 1981/82, assessment work was conducted on the Coquitlam, Vedder, Louis, Nicola, Chilko, Morice and upper Bulkley Rivers to evaluate

existing steelhead habitat and consider enhancement options. Highway and industrial impact studies were conducted on the Coquihalla and Coldwater Rivers as well as pre- and post-flood evaluations on the Salmon River in Langley.

All Vancouver Island watersheds from Victoria to Sayward including the Gold River system were evaluated to determine the capability of inaccessible headwaters to rear steelhead. The Nitinat and San Juan Rivers were also examined for headwater fry stocking opportunities. The Nitinat River was found to afford major stocking options. Barrier removal and/or fry stocking programs are proposed for both systems.

The placement of boulders in creeks increases the amount of available rearing habitat for salmonids. Boulder treatment projects completed in 1980 were assessed to determine the benefits of this enhancement technique for steelhead and sea-run cutthroat trout. In 1981, boulders were added to Scott, Hoy and Bear Creeks in the Lower Mainland and to Springer Creek on Vancouver Island.

Six gravel spawning platforms were installed in Camera Channel, a tributary of the Atnarko River, to compensate for the destruction of spawning habitat by highway construction. Pink and coho salmon have already been observed utilizing the platforms and it is anticipated that the spawning success of steelhead will be substantially improved.

Self-cleaning screening devices were installed on three irrigation ditch intakes in the Nicola River area. Prior to screening, steelhead fry moved through the intakes into farmers' fields and were lost.

This year, steelhead radio tagging studies were carried out on the Kitsumkalum (Kalum) River, a major tributary of the Skeena River. In 1981, 22 adult steelhead were radio tagged and 44 fish spaghetti tagged to follow the movements of steelhead through the sport fishery, to locate wintering areas, and to determine time and location of spawning. Results indicate that Kitsumkalum Lake is utilized as a wintering area and spawning occurs in the mainstem river above and below the lake as well as in tributary creeks.

Snorkel surveys and angler creel census continued to assist fisheries biologists in estimating steelhead adult returns.

Steelhead Harvest Analysis

In 1980-81, 22,301 steelhead angling licences were sold. Steelhead questionnaires were sent to a randomly selected group of licenced anglers requesting information regarding their fishing success. Responses were received from 7,424 fishermen and the results were incorporated into the Steelhead Harvest Analysis report. Information compiled from the questionnaires indicated that an estimated 12,894 anglers spent 131,886 days fishing for steelhead in British Columbia. Of these, 6,383 anglers caught a total of 50,924 fish, a considerable increase over recent years. The number of fish caught and released was higher than ever at 79%.

When steelhead adult returns are predictably low, catch and release restrictions are a necessary protective measure. In 1981/82, a catch and release fishery for wild steelhead was imposed on all Vancouver Island streams from December 1 to March 1, as well as on many other waters throughout the province where there have been serious declines in fish stocks.

Inland Fisheries Management

Inland fisheries management is directed towards protecting and enhancing our inland sport fish populations to meet angler demands. It is the counterpart of S.E.P. and is concerned with native fish species other than anadromous salmon, steelhead and searun cutthroat.

The Fisheries Research Section continued aeration experiments on Gardom, Wolloper and Lodgepole Lakes. Most small lakes in the Thompson and Okanagan area are extremely rich in nutrients, a condition which can result in low dissolved oxygen levels and consequent winterkill of fish. Air pumps installed on Gardom lake were used to circulate air and increase oxygen levels during the winter, thus improving the over-winter survival of rainbow trout. Previously, trout occu-

pied only one third of the lake but aeration has since made the entire lake habitable. Further studies were conducted on 20 lakes to predict oxygen depletion rates and their effect on winterkill.

Skaha Lake was stocked with 150,000 juvenile kokanee salmon and studies were developed to determine the effect of release size and timing on survival. Fish growth was monitored to determine the carrying capacity of the lake. An estimated 500,000 kokanee will be stocked in 1982.

Genetic manipulation of rainbow trout to produce all female fish was studied as a method of producing quality fish for lake stocking programs. Experimental stocks released in Noble Lake near Kamloops were examined to determine its effectiveness.

About 530 lakes were stocked with rainbow trout and another 82 lakes with eastern brook trout.

Successful egg collections in the fall of 1981 enabled fisheries staff to plant 4.4 million kokanee eggs in four streams in the Kootenay Region and one stream (Canimred Creek) in the Cariboo Region. As part of a continuing enhancement program on the Arrow Lakes, approximately two million eyes eggs were places in gravel at the recently completed Hill-McKenzie spawning channel. An additional one million went into the Inonoaklin River. Hill Creek and Redfish Creek spawning channels were also seeded with 1980 brood year kokanee fry (0+).

As partial compensation for development of the Peace Canyon Dam, the Peace Canyon Hatchery was constructed and was officially opened on July 28, 1981. The first rainbow trout yearlings will be released into Dinosaur Lake (Peace Canyon Reservoir) in May 1982. This hatchery near Hudson Hope was developed in cooperation with B.C. Hydro and Power Authority.

The design and feasibility of a hatchery to raise Dolly Varden char and rainbow trout at the site of the Hill-McKenzie spawning channel continued in 1981. Hatchery construction will commence in early 1982. This project is funded by joint agreement between B.C. Hydro and the Ministry of Environment as compensation for the construction of Revelstoke Dam.

In the Okanagan, 14,000 yearling rainbow trout were released from Kelowna pond with an additional 40,000 fish on hand for release in 1982. Hatchery reared trout comprised over 35% of the catch for their age group in Okanagan Lake. This was similar to the sport catch of kokanee in Skaha Lake.

Five lakes in the Chilcotin-Cariboo were brought into production by stocking with rainbow trout. This the the culmination of several years of study of potential fishing lakes which are barren of sport fish. Numerous Cariboo lakes have this potential for production.

Studies of lakes on northern Vancouver Island indicate that these waters are less productive than originally thought. Management plans to prevent over harvesting of fish stocks are being developed.

In the Lower Mainland, a fishway was constructed at the outlet of Hicks lake, with cooperation from the Parks Branch, to provide access for rainbow trout to spawning areas. Kokanee spawning access was made available by a fishway on Kawkawa lake. B.C. Hydro assisted in the improvement of rainbow trout spawning habitat by adding gravel to Anmore Creek, a tributary of Buntzen Lake.

In the Kootenays, a spawning channel was completed at Hill Creek, a tributary of Upper Arrow Lake, with funding from B.C. Hydro as mitigation for the Revelstoke Dam. The spawning capability of this channel is 100,000 kokanee salmon. It is also expected to increase the present run of 100 Gerrard rainbow adults to 1,000.

The existing Meadow Creek spawning channel had the largest return ever in 1981 at 1.5 million kokanee. This coincided with the doubling of the kokanee sport catch in Kootenay Lake.

Arctic grayling (adults and juveniles) were taken from Trimble lake and introduced into the Sukunka River upstream of the waterfalls to establish a resident grayling population. Previously, only Dolly Varden char were present in this inaccesible area.

Yellow perch were transplanted from Swan Lake to Charlie Lake near Fort St. John. In 1982, Stoney lake will receive similar transplants. Sturgeon in the Nechako River has been

radio tagged or marked with a tatoo as part of an ongoing study to monitor migration patterns and life history characteristics. The program is still in its early stages.

Many lakes and streams were investigated for habitat improvement possibilities. Inventory of lakes involving limnology, fish sampling and creel census provided an index of productivity.

Marine Resources Program

This program encompasses responsibility for management of oyster and marine plant resources, licencing fish buyers and processing plants and regulating the sale and handling of commercial fish in British Columbia. In these respects the program serves an economic development and management role through administration of the Provincial Fisheries Act and the Fish Inspection Act; the Marine Resources Branch administers these acts and represents provincial interests in the commercial fishing industry. To this end officials represent the province at all international fisheries and boundary negotiations that affect the viability of the B.C. industry.

PRINCIPAL GOALS

1. To maintain and expand employment and profit opportunities for British Columbians through the utilization of finfish resources and the management of marine plant, and cultured shellfish resources.
2. To influence the formulation, direction and application of federal fisheries policy for the benefit of the B.C. commercial fishing industry and to similarly influence relevant provincial policies.
3. To ensure that the fish processing, buying and fish-transporting sector operates in a manner which produces a quality product consistent with the regulations of the Fish Inspection Act.

PRINCIPAL OBJECTIVES

Licencing Section

1. To provide a level of enforcement and inspection sufficient to protect consumers, resources, and encure accuracy of recording and reporting of all sales of fish.

Finfish Policy and Resource Development Section

1. To expand access to resources through advantageous placement of new International Maritime Boundaries and to support positions advantages to the B.C. industry in west coast international fisheries negotiations.
2. To develop a system of Coastal Zone Management that will foster the development of mariculture, and ensure the compatibility of economic development and recreational use with protection of habitat of renewable marine resources.
3. To improve value added to processing and utilization of product.
4. To collect, analyze and distribute statistics on product production.

Shellfish Management and Development Section

1. To increase and diversify oyster culture production.
2. To diversify shellfish culture (scallops, mussels, abalone) through research and development of technologies.
3. To protect and manage oyster culture and wild oyster habitat.
4. To create a favourable investment climate for the maintenance and expansion of the shellfish culture industry through policy development and implementation and through provision of advice to both private and public financial institutions.

Marine Plant Management and Development Section

1. To develop kelp management and edible seaweed resource management plans that will sustain kelp meal, edible seaweed, and alginate extraction industries.
2. To ensure that all seaweed harvesting operations are appropriately regulated through issuance of harvest licences.
3. To accommodate the special interests of Indian people in the issuance of commercial seaweed harvesting licences.
4. To create a favourable investment climate for the development of a seaweed industry in B.C. through implementation of harvest strategies compatible

with other renewable resource uses.
5. To provide public information and education material in cooperation with the Information Services Branch on the use and protection of both wild and cultured commercial and recreational renewable marine resources.

Inspection, Licencing and Enforcement Section

The number of processing plant licences issued decreased by 7% from 371 in 1980 to 346 in 1981, compared to a 6 and 8% increase in the preceding years; similarly the number of fish buyers' licences decreased by 13% from 672 to 595. The reduction in number of licences issued is probably a reflection of lower quotas and prices in the herring roe fishery.

Of the four canneries licenced to can sport caught salmon, only three operated and production was down from 229,117 in 1980 to 178,994 in 1981.

Although one less commercial salmon cannery operated in 1981, production was substantially (63%) above the 1980 season (see Table 3).

Investigations were directed at the illegal sale and processing of fish on vessels, sales of shellfish directly from harvester to retail outlets, and thefts of oysters from leases.

Amendments to the Fisheries Act and associated regulations were drafted.

Finfish Policy and Resource Development Section

INTERNATIONAL FISHERIES NEGOTIATIONS

Provincial interests were represented at negotiations between Canada and the United States to limit and coordinate their interceptions of salmon. Although the negotiations began to falter early in the year, a two year interim Agreement was signed to limit selected fisheries and aid conservation. The year ended with a very optimistic view to completing a long-term Agreement within one year. Marine Resources Branch staff supported the trend of the negotiations and developed clauses which will include steelhead in the Agreement, and supported those which will ensure that British Columbia fishermen are entitled to a catch of salmon commensurate with the value of salmon produced in British Columbia waters.

Marine Resources Branch staff also supported the establishment of an Albacore Tuna Treaty between Canada and the United States. The Treaty permits reciprocal fishing and limited port privileges to fishermen of both countries.

FISHERIES POLICY AND RESOURCE DEVELOPMENT

Federal advisory committee meetings were attended in order to analyse and interpret federal policies. Legislation was established which required that all salmon landings be recorded on federal landing slips. This action ensures that an accurate estimate of catch is available for fisheries management, and it discourages the illegal sale of salmon by poachers.

The fish buyer and processor licence system was restructured to reflect the existing activities in the industry and to provide reliable information to assist in provincial policy implementation. Analyses of this sector are in progress with the objective of developing provincial policies which will assist in stabilizing the industry to maintain the existing level of employment and assure the long-term economic viability of the industry.

Changes to provincial legislation were made to allow mariculturists to gain access to guaranteed loans under the Agricultural Credit Act.

FISHERIES STATISTICS

The transfer of responsibility for the collection and dissemination of processed product production statistics from the Department of Fisheries and Oceans to the Marine Resources Branch was begun in January and completed by March. This section will publish the Annual Production Statistics Report, the Fish Freezings Report and the Canned Salmon Report.

FISH PROCESSING TECHNOLOGY

A joint project was funded with the Technology Services Branch of the federal government to analyse hake roe and flesh in order to increase its marketability. Hake flesh normally becomes very soft and unmarketable if it is not processed immediately after being caught. Therefore, hake stocks worth up to 20 million dollars per

annum have been processed by foreign factory ships off the B.C. coast. This research project has demonstrated that the soft flesh condition is caused by a parasite which is only found in the offshore fisheries which means that hake in the Gulf of Georgia can now be harvested by B.C. fishermen. The study has also revealed that hake roe may be harvested for foreign markets.

MARICULTURE DEVELOPMENT

Joint research between the Marine Resources Branch and the federal Resource Services Branch was undertaken to develop the commercial potential of rainbow trout reared in seawater. The primary objectives are to increase the economic viability of trout farming in seawater through practices to reduce mortalities from disease (nephrocalcinosis), the formulation of low-cost diets, and the development of hybrids. The studies have been successful and some results are now being transferred to private industry.

COASTAL ZONE MANAGEMENT

The concept of coastal zone management is becoming of paramount importance as the competition for use of British Columbia's foreshore areas increases. Staff have initiated a mapping system which will enable the establishment of priority use areas for the mariculture industry. The long-term result will be the establishment of mariculture reserves along the coast which can be protected from perturbations by other industry and recreational uses. This system will in turn protect non-mariculturists from the encroachment of mariculture operations and concentrate the need for environmental surveillance.

Shellfish Management and Development Section

SHELLFISH INDUSTRY DEVELOPMENT

Since last report, there has been a 17% increase in the number of registered oyster growers from 100 to 117; the total acreage under lease has increased by 115 for a total of 2,800.

The demand for permits to harvest wild oyster stocks remained strong; 61 permits were issued to harvest 118 tons. In most cases, there were more applicants than available oysters; allocation to individual applicants were therefore smaller than applied for tonnages.

The longline culture feasibility study has shown that this technology can be applied to British Columbia; growth rates have varied somewhat from site to site and fouling of oysters has varied between sites. Oysters from this commercial trial will be processed rather than sold on the fresh market; trial, automated processing is scheduled for 1982.

The feasibility of culturing scallops in British Columbia is being explored in co-operation with the Nanaimo Biological Station. Of 32 species of scallops native to B.C., four are amenable to culturing and one of them is very similar to the species cultured extensively in Japan. The Japanese species will be tested to determine the feasibility of culturing it in B.C. Studies will focus on development a reliable source of seed, and assessing growth and survival at several sites within B.C.

The unexpected mortality of oyster seed in Pendrell Sound is being investigated; results to date suggest that mortality is not caused bay genetic defects and may be related to food supply and/or oceanographic conditions.

EXTENSION AND LIAISON SERVICES

The first year of the B.C. Shellfish Mariculture Newsletter received widespread acclaim within the industry and has also been in demand outside of established industry.

Plans for a shellfish demonstration and research facility were developed by the B.C. Building Corporation and cost estimates prepared. Because the costs and escalating rents to be charged by the Corporation were too high, it was decided to provide services from an alternate, proposed new facility at Nanaimo.

SPATFALL PREDICTION SERVICE

Predictions of the time at which oyster seed will set were provided for both Pendrell Sound and Pipestem Inlet (west coast). Pendrell Sound produced a poor set but a heavy set occurred in Pipestem. Pipestem was not previously known as an oyster seed producing area.

HABITAT PROTECTION

Involvement in the Moares Island timber harvesting has focused on ensuring protection of shellfish growing areas. Assessment of impacts on shellfish habitat by proposed natural gas processing installations was provided to the Assessment and Planning program.

A draft protocol agreement between the Ministries of Lands, Parks and Housing and Environment was finalized; terms of the agreement will provide improved protection for shellfish and other mariculture sites.

Marine Plant Management and Development Section

RESEARCH AND DEVELOPMENT

Changes in program objectives early last fiscal year resulted in termination of all research on seaweed culture projects.

KELP HARVESTING

Ensmar Resources Corporation was issued a licence to harvest up to 5,000 wet tonnes of kelp per year off Porcher Island, near Prince Rupert. Surveys made in mid 1981 determined that bull kelp stocks in the area had declined markedly since 1976. Baseline measurements were made of density and average weight, as well as the status of sea urchin, abalone and understory plant populations. Determinations of the composition of the fish community and its variability within the study area were made. As a result of objections registered by local Native groups, Ensmar was not able to start a harvest operation in 1981.

KOMBU HARVESTING

Due to export market conditions the kombu (edible kelp) harvest operation initiated in 1980 at Port McNeill was inactive in 1981. Studies of seasonal annual changes in weight of kombu, density and commercial quality were continued on a reduced scale. Markedly reduced recruitment in plots harvested in 1980 indicate that harvested areas will have to be left 3-5 years before reharvest.

KELP HARVESTING: HERRING SPAWN-ON-KELP INDUSTRY

Nearly 100 wet tonnes of the giant kelp Macrocystis were harvested to supply substrate for the herring spawn-on-kelp industry in 1981. The product, komochi kombu, is exported to Japan and was valued at over $3 million.

PORHYRA HARVESTING

A pioneering commercial Porphyra (nori) harvesting operation made significant progress in 1981 with the construction of a drying plant on Langara Island. Surveys showed that the standing crop in July, 1981, averaged about 250 g/m^2, and was only 45% of that recorded in mid-July, 1980. Further, only 26% of the standing crop was harvested by commercial hand harvesters. Indian people are opposed to the harvest of Porphyra for other than their traditional uses, but have not responded to requests to identify traditional harvest sites.

KOMBU CULTURE

Significant progress was made toward the development of commercial kombu culture technology in this final year of funding. Manipulations of the depth at which culture lines are suspended, spacing of plant clusters, density per cluster and time at which cluster thinning is carried out have resulted in optimal farming practices. Analyses of environmental parameters and production at selected sites have resulted in a method for selecting best growing sites. Kombu culture may well alleviate many of the problems related to acquisition and maintenance of kelp faced by herring spawn-on-kelp operators.

Waste Management Program

The Waste Management Program under the direction of the Director of Pollution Control is responsible for the administration of the Pollution Control Act and the Litter Act. The goal of the program is to manage waste materials from society and industry for the protection of the environment and the conservation of resources and its objectives are:

1. To regulate discharges of waste so as to control pollution of the environment of British Columbia.
2. To maintain an inventory network and data bank on waste discharges and environmental quality to assist surveillance functions and enabale planning activities.
3. To assist in the development and implementation of planning strategies for the management of the environment.
4. To safeguard the environment from hazardous materials by cleanup of spills and by the development and administration of programs designed to prevent and respond to spill incidents.
5. To inventory, assess and classify materials now being wasted and to develop and implement plans, procedures, practices and programs for alternative uses or control of these materials where possible.
6. To initiate and direct investigations and research into problems associated with waste discharges and to undertake special studies and investigations on the impact of materials products and wastes on the environment.
7. To provide education and information respecting waste materials and environmental quality.

During the year the decentralization of the Waste Management Branch continued and a headquarters establishment was finalized. The movement of people and positions to the regions will continue into the next year.

In carrying out its responsibilities under the Pollution Control Act, the Waste Management Branch received 362 applications for Pollution Control Permits and 247 applications for permit amendment during the year. 246 new permits were issued and 196 permits were amended.

The Auditor General carried out a comprehensive audit of the Waste Management Program and identified a number of areas which required improved control. The Auditor General observed that management had identified most major areas raquiring improvement and steps are being taken to implement the necessary controls.

POLLUTION CONTROL SECTION

The primary function of the Pollution Control Section has been to assess applications for Pollution Control Permits. During the reporting period the first stages of decentralization began in that any processing positions which became vacant were transferred immediately to the regional office where the bulk of permit processing will take place in future. Any staff left in Victoria after decentralization is complete will provide advisory services.

Economic recessionary conditions resulted in a slowdown in construction activity throughout the province toward the end of the reporting year. However, sewerage projects planned through the issue of sewerage construction certificates reached an all time peak of 770, up from 688 for the year 1980-81. The result will be a ready supply of serviceable lots when economic conditions improve.

Staff attended information meetings related to municipal refuse disposal by the Regional District of Central Kootenay at Barrett Creek, and a waste disposal system proposed by Valleyview Enterprises Ltd. in connection with a recycling operation to be located on the east side of Kamloops. Local residents rigorously objected to both proposals.

Staff also attended appeals against the Director's decision to

issue permits to the Village of Chase, the Village of Keremeos, Valleyview Enterprises Ltd., Kamloops, and Amorello Enterprises Ltd., Nelson.

A number of cities in the province are finding the disposal of treated sewage effluent increasingly difficult and complex. A task force was set up to evaluate some of the options open to the City of Kamloops where major competing users of the Thompson River involve municipal effluent waste disposal, pulpmill effluent disposal, fisheries, ranching, water supplies, urban development and tourism. While the Task Force did not develop a definitive plan for the City to follow, it established benchmarks to assist in evaluating future decisions.

Armstrong-Spallumcheen, Vernon and Penticton are also involved in municipal waste disposal systems that are becoming more difficult to deal with as the volume of wastes continues to increase with community growth.

The Iona sewage treatment plant serving the City of Vancouver was given a permit to construct additional facilities in order to reduce plant overloading. They were also required to provide plans and a schedule by June, 1983 for a program to reduce the discharge effect on Sturgeon Bank waters.

The Regional District of Comox Strathcona is constructing a new $30 million secondary treatment plant and outfall system at Cape Lazo to serve the Courtenay, Comox and CFB Comox area. The 2,750 metre outfall at the depth of 60 meters should be one of the most efficient in the province. Scheduled completion date is December 1983.

The Amax of Canada Limited mine at Kitsault continued to hold the spotlight in 1981. Production at the mill started in April. In May, a petition launched by the Nishga Indian Band to have the Pollution Control Permit declared null and void was rejected by the Court.

On October 14, 1981, a Pollution Control Permit was issued to Amax for the air emission from the mill. This permit was appealed to the Environmental Appeal Board, but no decision has been handed down at this time.

Another project which received considerable public attention was Cinola Operating Company's proposed gold mine/mill operation in the Queen Charlottes, where pilot plant studies were carried out.

Processing of permit applications was completed for the southeast coal development by Crows' Nest Resources at Line Creek. With a total annual capacity of about 2 million tons per year, production of thermal coal began in January 1982 with shipments of metallurgical coal to commence early in 1983.

Applications have also been filed by B.C. Coal for the new Greenhills coal development near Elkford. This will represent an increase in production of approximately 1.8 million tonnes per year.

During 1981, Westcoast Transmission Company Limited commenced expansion of its sulphur recovery facilities to 600 tonnes per day at the Fort Nelson gas plant, necessitating a permit amendment and requiring an upgrading of the recovery facilities to 95% recovery from 85%.

A permit amendment was granted to Gulf Canada Limited for the emissions from the refinery at Kamloops. The amendment allows the refinery to continue operating under an ambient control regime.

Pollution Control Permits have been issued to Ocelot Industries Limited for the 1200 ton per day methanol plant in Kitimat presently nearing completion.

Due to economic conditions, requests for delays in the completion date on new programs were received from a number of forest industry companies during the year. However, many programs already underway were completed.

A new thermo-mechanical pulp mill started up at Quesnel, with full secondary treatment of the effluent. Additional thermo-mechanical pulping capacity was installed at three newsprint mills.

An installation for the drying of hog fuel, using heat from boiler waste gases, was put into operation at Powell River. A second hog fuel drying system is being installed at B.C.F.P., Crofton.

New outfalls and diffusers for the discharge of pulp mill effluent into marine waters are being installed at two mills, Port Alice and Port Mellon.

A new Teller scrubber, to control recovery boiler TRS and particulate emissions was put into operation at Elk Falls in early 1982. Similar scrubbers are being installed at Gold River and Port Mellon.

An exfiltration system to reduce the colour in the effluent was put into service at the Crestbrook pulp mill, with excellent results.

A number of Interior sawmills have installed woodwaste burners with heat recovery systems, as an energy conservation measure.

ENVIRONMENTAL SAFETY PROGRAM

The Environmental Safety Program, Waste Management Branch, is responsible for spill response and prevention in conjunction with the Provincial Emergency Program. It is also concerned with the coordination, management and development of programs for special wastes. These wastes, due to their nature and quantity, are potentially hazardous to human health and/or the environment, and require special disposal techniques to reduce or eliminate the hazard.

From April 1, 1981 to March 31, 1982, approximately 445 spill reports were received and 65 were of major significance. A large spill of ethylene dichloride and ethylene glycol into the Thompson River at Blue River and a spill of sodium cyanide in Kamloops were among the major incidents.

During this period, one emergency declaration under section 5 of the Environment Management Act was proclaimed. A spill of PCBs resulted from a leak in a transformer stored at a scrap and salvage site located off mile 304 of the Alaska Highway. Because ownership of the transformer had not been definitely established, the environmental emergency was declared so the necessary equipment and manpower could be obtained for clean-up and proper storage of the PCB contaminated fluid.

Interim special waste storage areas located in Kamloops, Nanaimo, Prince George, Smithers, Terrace, Surrey, and Victoria provided an important service by receiving a variety of waste household, educational, agricultural, and pharmaceutical chemicals. During this period, approximately 150 large drums of these materials were shipped to a licensed disposal site in Arlington, Oregon.

Important strides were taken toward the development of special waste management facilities in British Columbia. The report "Hazardous Waste Management in British Columbia" was completed by the Hazardous Waste Management Advisory Committee. Composed of representatives from British Columbia industrial, governmental, educational, and environmental institutions, the committee brought forward 34 recommendations concerning their terms of reference. These reports are available from the Waste Management Branch of the Ministry of Environment. The Ministry issued a widespread call for competitive proposals for the handling and management of special wastes in the province. Of the 41 companies expressing an interest, 22 were selected to provide complete, detailed special waste management plans.

RESOURCE RECOVERY

The fifteen objectives of the Waste Management Branch include four which are soley for the purpose of resource recovery and eight others which impinge on it. In summary, the four objectives are to inventory, assess and classify materials now being wasted, to develop plans for alternate uses of such materials, to administer the Litter Act (other than enforcement) and to operate Project SAM. The latter is a scheme which crushes abandoned car hulks and transports them to a firm in the lower mainland for remanufacture into steel reinforcing bars.

The most significant of the eight other objectives, from the viewpoint of resource recovery, is the provision of information and educational services. Most jurisdictions involved in this matter have deduced that education and information are paramount concerns if useful materials are to be diverted from waste.

A major step was completed in the previous year in assessing materials through completion of studies examining municipal waste, office paper, glass and scrap metal. This has now been supplemented with more specific information derived from experimental programs carried out in West Vancouver and Saanich to recover household wastes.

Substantial progress has been made in further examination of glass wastes including a workshop attended by various experts from across the continent. A report is being prepared in-house on the present operations of the province's pulpmills to see if promoting wider use of waste paper in the manufacture of pulp is practical. British Columbia uses less waste paper in this manner than elsewhere on this continent and much less than Europe.

The "Oil-Save" program has been continuously extended. Under this program, gas stations are asked to take back used motor oil to be processed for re-use with no loss of effectiveness; at the same time this avoids environmental degradation from wanton disposal. Over 500 gas stations have now been enrolled.

A minor but significant program was arranged in co-operation with Borden Mercantile Ltd. to utilize lime bags (non-caustic) for school clean-up programs, thus saving the burning of the bags and the purchase of plastic bags.

Progress has been made in developing a project to retrieve the 71 million wine and spirit bottles discarded annually, for crushing, cleaning and feeding into the base stock for manufacturing new glass.

Resource Recovery staff have been extensively involved in promoting the use of sewage effluents and sludges on land. The former has proved more expensive than had been hoped but the City of Kamloops has decided to adopt this course. The use of effluent to grow food for human consumption would help pay for such projects and this is under study. Recommendations will soon be made in co-operation with other ministries to better control application of sludge to land. This should benefit agricultural practice in the province.

An experimental program to re-use the rubber from old tires to incorporate into asphalt for roads was carried out in cooperation with the City of Victoria.

In general, the promotion of resource recovery has been adversely affected by the falling markets but significant advances have been made.

A major breakthrough has been the co-operation achieved by the Ministry's Information Services Branch with the Ministry of Education and others in the educational field to introduce appropriate material about wastes into school curricula.

REGIONAL OPERATIONS

The decentralization of the Waste Management Program continued throughout the year and a number of positions were transferred from the Victoria Headquarters to Regional offices. The staffing of the Regional offices did not keep pace with the transfer of responsibility and some delays in operation resulted. The Cariboo Regional office became operational in January, 1982, and eight Regional offices are now established.

VANCOUVER ISLAND REGION

In response to an Order of the Director of Pollution Control, the Regional office has been involved in the direction of the Buttle Lake Study Committee which provided guidance to Westmin Resources in their monitoring to determine the sources of heavy metals in Buttle Lake. B.C. Research, with Simco and Knight & Piesold carried out moniotoring of surface water, groundwater and tailings disposal facilities respectively. Regional staff were also involved with monitoring being carried out on behalf of the Ministry.

Regional staff met with the developer and the consultants regarding studies and monitoring programs designed to determine the suitability of the proposed Quinsam Coal Development.

LOWER MAINLAND REGION

An environmental enforcement team made up of three conservation officers and two Waste Management technicians, carried out 55 investigations and commenced six prosecutions.

Extensive negotiations with the Fraser River Harbour Commission regarding their Richmond Landfill site resulted in a permit which provides for the control and treatment of toxic leachates.

As a result of negotiations, La Forge Cement implemented a total effluent recycle system which replaced a problem discharge into the Fraser River.

Regional staff carried out extensive discussions and monitoring of the Premier Street landfill in North Vancouver resulting in reconstruction of leachate control works and improvements to the landfill operation.

Sawmill and wood treating plants which have been using P.C.P.'s were required to clean up their sites and improve operations to prevent P.C.P. spills.

Significant improvements were achieved in the quality of discharges from gravel washing operations along the Coquitlam River.

A comprehensive study of the effect of storm water runoff from residental and industrial areas along the Fraser River was commenced.

THOMPSON NICOLA

The water quality section of the Nicola Basin Strategic Plan was completed. This is the first comprehensive Ministry Plan to be completed and includes an integration of information from the Waste Management, Water Management, and Fish and Wildlife Management programs. The plan is intended to optimize use of environmental resources within the Basin.

The Clinton Creek study to assess the effect of discharges from the Village of Clinton and non point source discharge was completed and has been released to the public.

Several serious hazardous spills were handled by staff including a sodium cyanide spill in downtown Kamloops and a significant spill of dimethyl chloride at Blue River.

Regional response to the B.C. Hydro Environmental Impact statement on the Hat Creek project for the Energy Project Coordinating Committee of the Public Utilities Commission was prepared.

Assessment of data discharges from mining operations in the Highland Valley and on the water quality of streams emanating from the valley was completed. This will form the basis for a review of monitoring programs for mines now in the valley.

KOOTENAY REGION

Increased attention toward major discharges having the greatest environmental significance continued. Intensive effluent and receiving water monitoring programs were undertaken to determine fluctuations in effluent quality and the impact of major discharges on the environment. These are an aid to continuing negotiations for abatement works required to upgrade industrial emissions and waste water discharges.

More assertive enforcement of municipal pollution control permits resulted in improved operation of some sanitary landfills. Input into regional and sub-regional planning was initiated to develop an anticipatory approach to waste management requirements. Involvement in the development of strategic plans in the East Kootenays was initiated.

Projects included environmental monitoring of heavy metal analysis of the lower Columbia River, a productivity assessment of Tie Lake and an evaluation of the impact of Kootenay River on the water quality of Wasa Lake. A long term monitoring program was initiated to document the impact of increased nutrient levels on algal growth in the Elk River system.

CARIBOO REGION

The Cariboo Region became autonomous with the appointment of a Regional Manager in January 1982.

A significant sampling program to identify nutrients in the San Jose River, and information exchange and negotiations with Cattle Ranchers in the San Jose River Valley were carried out to reduce nutrient input to the river.

The problem of smoke and flyash due to the density of sawmills in the Williams Lake area was identified and negotiations are proceeding with sawmill operators to reduce the problems.

SKEENA REGION

An acid generation problem was discovered at Equity Silver Mines Ltd. The company has installed a series of collector ditches and the seepage is now being pumped to the tailings pond for neutralization and disposal. Additional treatment and preventive measures are under consideration. Waste Management staff participated in a daily surveillance program during the successful startup of the Amax opera-

tion at Kitsault, British Columbia. B.C. Timber Ltd. has agreed to a multi-million dollar program to improve the pollution control works at its kraft pulp mill operation at Prince Rupert. The District of Terrace agreed to replace the existing primary sewage treatment plant with an aerated lagoon facility.

The Environmental Section became active in 1982 with the hiring of the Section Head. An extensive monitoring program was designed and implemented in conjunction with the acid generation problem at Equity Silver. Waterfowl tissue samples were collected at Kitimat as part of the investigation of conditions in the harbour.

A regional environmental safety officer was hired to oversee the environmental safety program. Regional staff responded to 57 spills of hazardous materials compared to 34 in the previous fiscal year.

The Regional Waste Manager is participating in the Yukon River Basin Study as Chairman of the Placer Mining Workgroup and as a member of the Technical Advisory Group to the Study Board.

OMINECA-PEACE REGION

During this fiscal year the emphasis was on North East Coal and on bringing the major pulp mills, gas processing plants and oil refineries into compliance with their permits. Agreements have now been reached with all five pulp mills in Prince George and Mackenzie to meet the Level A requirements between 1983 and 1985. Westcoast Transmission has made substantial improvements in the operation of their three gas processing plants, especially in Fort Nelson where their very large plant is located. Several years ago they were only averaging approximately 40% sulphur recovery while this past fiscal years they have been recovering approximately 90% of the sulphur, resulting in much less sulphur being emitted into the atmosphere.

Extensive negotiations and possibly legal action are still required before the Petrocan oil refinery complex at Taylor will be brought into compliance with their permits.

OKANAGAN REGION

The Okanagan office was fully consolidated in Penticton consistent with Ministry reorganization and decentralization. Now in-house procedures have been developed to streamline the legislative functions of permit processing and administration and the 1981-82 target levels of achievement have substantially been met within budget.

The municipal section made considerable progress in resolving the City of Armstrong's waste disposal problem, an outstanding issue for over a decade. This involved considerable negotiations and liaison with the District of Spallumcheen, the public, the farming community, consultants and senior levels of government. Initial efforts were also taken to develop a regional waste reclamation irrigation scheme involving the City of Vernon, the District of Goldstream and the above mentioned communities. A number of crisis situations have also been attended, including the diversion of the City of Vernon's discharge to Okanagan Lake.

Other communities in the Okanagan, with two exceptions, are actively implementing their waste management programs, with the city of Kelowna having completed their advanced waste water treatment facilities.

The Industrial and Air section attended to permit administration and processing and has developed schedules and systems involving the word processor to streamline accountability of activities.

The Environmental Assessment section continued with baseline and limited enriched water quality surveys and has been actively involved with Okanagan Basin Implementation-Basin Recommendations for continued water quality management.

Water Management Program

The goal of the Water Management Program is to manage the water resources of British Columbia so that the greatest possible economic, social and recreational benefits can be realized by its residents, through reduced flooding and a supply of water which is plentiful and of good quality. This goal is met by:

1. Allocating and regulating the use and supply of water through a licensing system involving about 35,000 licences.
2. Preserving or enhancing water quality.
3. Reducing the potential for loss of life and property damage caused by erosion and flooding.
4. Ensuring an appropriate level of health engineering and technical standards for water supply systems and regulating privately owned water utilities.
5. Providing information on the capability of the resource to meet water supply needs.

The basic resources utilized in efforts to fulfill the above goal and associated objectives were a staff of 287 and 17.4 million dollars. The utilization and accomplishments of these resources are described in the Sections which follow, presented in terms of the above objectives.

WATER ALLOCATION AND REGULATION

General

Allocation and regulation of the water resource under a licensing system provides individuals, communities and industries with the water supply assurance required for social and economic development. With such assurance, in the form of water rights, developments ranging from rural homes to major forest products industries, or hydro power facilities, can proceed as valid investments.

In addition, excess use is regulated and unauthorized use is prevented to protect the water rights of licencees and thus provice an essential degree of social order.

The Office of the Comptroller of Water Rights, which includes the Deputy Comptroller, has overall responsibility for the program. The contribution of the Regional offices has always been significant and the first step in a decentralization program to expand the role of the Regional Water Managers was taken during 1981/82.

Water Licensing

Under the continuing Ministry of Environment reorganization, water licensing functions are being progressively decentralized from the Water Comptroller's Office in Victoria to reduce the time required for issuing a licence. During the period under review, Victoria staff were involved with the related preparation of policies and procedures, regional staff training and upscaling of the water license map data base in the regions. These, and other reorganizatin initiatives, placed additional work loads on Victoria staff whose numbers were depleted through retirement and re-posting. Similarly, in the regions, additional responsibilities and staff recruiting problems affected the water licensing program.

The number of new applications for water licenses received during the year under review was 1,751 compared with 1,847 for 1980. The overall application backlog increased from 3132 to 3474. In this same period 1,208 Conditional Water Licences and 89 Final Water Licences were issued, contributing to a total of 34,341 existing water licences.

Miscellaneous activities completed include 531 licences abandoned or cancelled, 4,646 changes of ownership or address, and 577 water licences amended. In addition, an enhanced rental arrears collection program recovered $6,000 in licence fee arrearas, and resulted in 157 water licence cancellations for failure to pay rentals. An improved system for reporting water use

for cities, municipalities and improvement districts was implemented.

Five water licences filed documentation leading to easement expropriation, and eight such proceedings were completed during the year.

With effect from September 1, 1981, the responsibility for issuing Approvals under Section 7 of the Water Act was transferred to the Regional Water Managers. In the period under review 346 and 334 Approvals were issued respectively by the Comptroller and the Regional Water Managers. In the period under review 346 and 334 Approvals were issued respectively by the Comptroller and the Regional Water Managers. The combined total of Approvals issued represents a 75% increase over the previous year.

In preparation for decentralization, eight weeks of training were provided to new regional staff by senior clerical staff in Victoria.

The charts in the Statistical Appendix to this report summarize licensing activities during 1981/82 fiscal year. (See tables 1 to 5.)

The mapping and draughting office prepared 1,761 water licence plates during tahe year under review. In addition, two new reference maps and 212 new water licence maps on the B.C.G.S. system were completed and 210 subdivision plans were added to our maps. Including new mylar conversions of old existing water licence maps, a total of 1333 maps were made and duplicated for seven of the eight regional offices. At the end of the period there was a backlog of 276 licence plates to be prepared and 830 new B.C.G.S. maps for converstion to water licence maps. The Lower Mainland Region maps were in abeyance pending information on the future availability of base mapping for that region.

Eight regional draughtspersons were given nine weeks preliminary on-job training in Victoria.

The Power and Special Projects Section, which provides specialist technical and advisory support to the Comptroller in licensing matters pertinent to hydro power and other large developments, has maintained continuing involvement in the proposed power development on the Peace River near Fort St. John (commonly known as Site C). A water licence application, and a concurrent application for an Energy Project Certificate under the Utilities Commission Act, have been filed by then B.C. Hydro and Power Authority, and the Utilities Commission has been directed to review the project. Section staff prepared a submission to the Commissio covering project-related Water Management Branch concerns. In addition, expert testimony was presented at the Utilities Commissions's Hearings in Fort St. John by the Section Head and by a specialist consultant, such testimony being in respect of technical and overall Water Management aspects of the proposed Site C project.

The implementation of the conditions of the conditional water licence issued in respect of the Revelstoke Hydro-electric Project is largely administered and monitored by staff of the Power and Special Projects Section on behalf of the Comptroller. The project is now scheduled for completion by May, 1984. Meanwhile, section staff and three specialist consultants continue to assess the engineering aspect of the dam. Staff members chair the Revelstoke Project Co-ordinating Committee and the Revelstoke Project Community Impact Committee which are charged with the continuing review of construction activities as well as environmental and social impacts on nearby communities. Input from regional water management staff and from other branches and Ministries has made a major contribution to the operation of these two committees and the continuing implementation of mitigation programs required as conditions of the water licence.

There are plans to expand the power plant and construct additional smelters at the Alcan project in Kemano which was authorized in 1950 under the terms of a special agreement and a water licence issued under the Industrial Development Act. Subsequent actions by the Federal Minister of Fisheries have limited the ability of the company to proceed. The Comptroller is represented by a staff member on the joint technical committee of Alcan, federal Government and provincial Government representatives which is considering the potential impacts of the proposed expansion with particular

reference to the regulated releases of stored water authorized by the existing water licence.

Possible flooding of some 5000 acres of wilderness in the Skagit Valley in British Columbia, as a result of Seattle City Light raising its Ross Dam, continues to meet stiff opposition from the provincial government. Power and Special Projects has played a leading role in negotiations with the City of Seattle, and in the subsequent referral to the International Joint Commission to request that agency to readjudicate its 1942 flooding decision. An I.J.C. Supplementary Order in April 1982 calls for a one year moratorium on flooding, during which time an eight person Special Board, with provincial representation, will attempt to resolve this long standing issue.

Since 1968, Power and Special Projects Section has coordinated all activities in British Columbia in connection with the formation of Lake Koocanusa by Libby Dam, in Montana. The greater portion of the program is now complete including 9,240 acres of reservoir clearing, resconstruction of two major bridges, 29 miles of highway relocation, 15 miles of Canadian Pacific Railway relocation, property acquisition (74 owners) a gas pipe-line crossing, some 1,400 acres of recreational park containing a 50-unit campground, reservoir perimeter safe line delineation, and various fish and wildlife mitigation projects.

In fiscal year 1981-82, the following items of work were completed at a total cost of $290,000:

1. Wardner Highway Bridge was removed and the substructure demolished.
2. Kikomun Creek Park boat ramp was improved.
3. Fish and Wildlife studies were continued.
4. A program of property fencing to maintain control of livestock was continued in view of reservoir bank sloughing.

The total spent on the Libby program to end of 1981-82 was $19,549,000.

Water Management Branch staff undertook reviews of water licensing requirements and water management assessment for several mining and industrial developments. These included 13 metal mines; 16 coal mines in the Southeast Kootenay area, the North East Coal Block area, and on Vancouver Island; and reports on the Natural Gas Allocation Process for proposed L.N.G., Methane petrochemical plants. There was also continued staff appraisal of pre-licensing feasibility studies in respect of possible power projects involving the Stikine and Liard basins in the north, and on the Columbia River at the Keenleyside Dam at Murphy Creek.

All fees, rentals and charges payable to the Crown in respect of applications, licences and proceedings under the Water Act were increased in the year under review. Power rentals are projected to produce an annual revenue of $178,000,000 per annum at current rates.

Regulation

In normal circumstances water licences are expected to install and operate works, and to store and divert water in accordance with the terms and conditions of their respective water licences and with due regard to the prior rights of other licencees. The regional water managers and engineers appointed under the Water Act have the powers necessary to regulate the storage and diversion of water and the structural integrity of dams and other works to ensure public safety, the protection of property, the beneficial use of water, and, the rights of licensees. This regulatory function becomes particularly critical during periods of drought, high freshet flows or during most summers in semi-arid areas where there are high peak demands on limited water resources. Other circumstances requiring special regulatory control include the drawdown of reservoirs for the closure of powerplants and the repair of dams, the release of stored water to enhance navigation, or to control flows for fisheries purposes, and to prevent streambank erosion.

Regulation required for dam safety purposes is a part of the dam safety program under the Flood Damage Prevention Activity.

During the period under review, 55 formal engineer's orders were issued under Section 37(1) of the Water act.

WATER QUALITY

General

The preservation and enhancement of the water quality is undertaken to protect water under licence or which may be licensed in the future.

Ground Quality

The Groundwater Section, which is responsible for providing technical and advisory support services to government agencies, undertook investigations and otherwise contributed to environmental impact assessment studies for major developments, basin planning studies, groundwater protection studies, water quality concerns related to natural phenomenon, the disposal of wastes and accidental spills. Details of typical assignments completed during 1982 are included in Table 6.

Surface Water Quality

The Surface Water Section includes among its activities the provision of technical support and advisory services regarding the preservation of surface water quality. During 1982, the staff preservation of surface water quality. During 1982, the staff reviewed environmental impact assessment reports submitted by proponents of coal, metal mines and linear developments as indicated in Table 7. Studies were continued to assess the potential impact of timber harvesting on the water supply in five watersheds in the Creston area. Proposals were assessed for harvesting in the Tulameen River watershed, which is the source of water for Princeton and includes the Cascade wilderness area.

The Kootenay Region staff participated in the finalization of terms of reference for the team planning approach to logging developments in watersheds supplying water to the City of Nelson. Meetings continue to be held with the Ministry of Forests to develop a policy to bring the management of the two important resources, timber and water, into balance in order to meet the need for special planning and management actions by the Ministry of Environment and the Ministry of Forests.

Public Water Supplies

The Public Health Engineeers of the Ministry advise the Medical Health Officers on the engineering aspects affecting the quality of the source for public water supply systems. During the year, this advice was provided for approximately 1000 water supply systems.

FLOOD DAMAGE REDUCTION

For the fifth consecutive year the snowpack in the Fraser and Thompson River basins was below average and there was again little change that damaging floods would occur in the Fraser Valley during the spring freshet.

A severe storm hit the Vancouver-Squamish-Pemberton area at the end of October 1981 causing several million dollars worth of damages. Besides compensation payments under the Provincial Emergency Program, some $2 million worth of stream restoration work was carried out by the Branch.

Runoff Forecasting

The accumulated mountain snowpack as measured in the spring of 1981 was average to below average in all parts of the province. During and prior to the snowmelt period, a total of 1281 snow surveys were made ata 273 established snow courses.

Forecasts of total volume runoff during the spring and summer period are made for all major rivers and reservoirs in B.C. The 1981 forecasts called for near average runoff in upper Columbia and northern areas, and below average runoff for the Fraser, Thompson, Kootenay, Okanagan, Similkameen and coastal watersheds. The recorded volume runoff was generally more than forecast due to above normal summer precipitation.

Short Term Forecasting

Although snowpacks throughout the southern half of the province were below average during the freshet, flows were monitored and the short-term flow forecasting computer models were activated. In the fall, the flood warning system for the Squamish River basin was operated and provided warnings of the high flows which occurred at the end of October. Good use was made of a new satellite-relayed data collection platform installed in the headwaters of

the Squamish River.

Floodplain Development Planning

The Planning and Surveys Section provides planning and technical advice to local authorities and landowners to enable to flood potential to be considered in any proposed development of land subject to flooding.

Direct control of the development of floodplain land is achieved through Section 82(1) of the Land Title Act, and also through Section 3(3) of the Bare Land Strata Regulations, where prior consent by the Deputy Minister of Environment is required before approval is given for the proposed subdivision.

Indirect control is obtained by advising local authorities on land use planning in floodplains and the incorporation of floodproofing requirements in zoning bylaws, community and settlement plans. A summary of activities is shown in Table 8.

Floodplain mapping is the basic tool used in the administration of floodable areas and is being produced as resources permit.

During 1981 the Surveys Section spent some 6220 man-hours on topographic, bathymetric and control surveys in four river valleys and one creek. Surveys were completed for approximately 295 square kilometers of floodplain containing approximately 120 kilometers of river.

Floodplain mapping was produced in 1981-82 for the following rivers: Chilliwack River above Vedder Crossing; Cowichan-Koksilah Rivers at Duncan; Tulameen River at Coalmont; Columbia River, Radium area; Kitimat River at Kitimat; Kootenay River, Kootenay Lake to U.S. border.

For a complete list of information on floodplain mapping and flood profiles, see Table 9.

Operation of Flood Control Works

Okanagan River: The responsibility for maintenance and operation of the Okanagan Flood Control Works was transferred from Victoria to the Region. The Okanagan snowpack was well below average and a wet spring and early summer resulted in Okanagan Lake filling to its normal upper limit.

For the first time, milfoil growth in the Okanagan Channel caused problems by restricting the outflow out of Vaseaux Lake. Weed harvesting in this section is proposed to alleviate the problem.

The Ministry was represented at public hearings held by the International Joint Commission and supported an application by the State of Washington to replace Zosel Dam at the outlet of Osoyoos Lake with a new structure.

Vedder River: A second draft of the Vedder River Management Report is now under review. This comprehensive report covers the implementation of flood control, recreational potential, agricultural and fisheries objectives within the Management area for the Vedder River section between Vedder Crossing and the start of the Vedder Canal. Many of the objectives outlined are now being implemented.

Channel Clearing and River Protection Assistance

Under the Channel Clearing and River Protection Assistance Programs the provincial government assists local authorities and private individuals with flooding erosion problems throughout the province.

Assistance provided by the Water Management Branch includes investigation of problems, preparation of reports, financial assistance (usually 75% of the cost) and construction implementation.

In 1981, 69 individual requests for assistance were received, 79 excluding many minor site inspection and referrals from other ministries and agencies were made and 69 reports were completed. Forty projects were implemented at a total program cost of $430,000. These projects included the Coldwater, Tulameen, Nicola, Similkameen, Fraser, Cowichan, Tsolum, Anderson, Elk, Goat, Pine and Kettle River valleys and Kelowna, Salmo and Alice Arm communities. Table 10 provides a summary of the year's activities and a comparison with those of previous years.

The storm which hit the Vancouver-Squamish-Pemberton area necessitated extensive restoration work funded through the Provincial Emergency Program. Following assessment of the damage, restoration work was completed at

22 sites and continues at three additional areas, leaving nine further projects yet to be commenced.

Restoration work following the December 1980 flood was substantially completed during the year. Total expenditure to the end of 1981 was $2,138,000.

The third year of a five year $3,200,000 ARDSA assisted program to rehabilitate and extend the Pemberton Valley Dyking District's flood and erosion protection work and drainage systems was concluded with total expenditure to the year's end amounting to $2,075,000. This project continued on schedule, with work being carried out along the Lillooet River and tributaries for both the Mt. Currie Indian Band and the remainder of the Dyking District.

Work was commenced on the initial phase of a $1,840,000 ARDSA project to provide flood and erosion protection for the Lower Similkameen Indian Band, I.R. #7. Expenditure during the year totalled $790,000.

Flood protection work for the District of Squamish resumed, with the expenditure of $850,000 of the predicted $1.5 m required to complete closure of the existing dyking system.

Studies during the year included: Bellevue Creek; Tow of Hope Dyking; Village of Kaslo Dyking; Musqueam River Dyking and review of the Kitimat Flood Protection. Work continued on the following studies: Nicola River Corridor; City of Merritt and Town of Princeton Dyking; Oyster River; Deadman River; Kispiox River; Slocan River; and the Port Moody, Hatzic Prairie and Haney Slide problem areas.

An advisory service regarding the probable impact of proposed works related to watercourses was provided to other agencies and ministries under the referral program.

Fraser River Flood Control Program

This program is principally for the construction of flood control works in the Lower Fraser Valley. It has been carried out under a federal/provincial agreement signed in 1968 which has been amended to allow for an expenditure of $120 million. Expenditures to March 31, 1980 totalled $91.7 million; expenditures for the fiscal year 1980/81 amounted to $8.06 million. A breakdown of expenditure for previous years is given in Table 10 and by project in Table 11.

Projects under construction during 1981 included Richmond, Delta, Pitt Meadows, Abbotsford and the Veddar River. Details of the status of projects are given in Table 12.

Further details are given in the annual reports of the Fraser River Joint Advisory Board.

Drainage

Drainage studies, and related project implementation are carried out to assist with the development of agriculture and to provide for increased production from poorly drained agricultural land. Most drainage projects are initiated through requests under the Federal-Provincial Agricultural and Rural Development Sub Agreement (ARDSA). The five year ARDSA Sub Agreement was signed in July 1977, and provides funds for carrying out engineering and economic feasibility studies, as well as for final design and construction of projects. Drainage projects active from April 1, 1982 to March 31, 1982 are described in Tables 13 and 14.

Dyke Maintenance

The purpose of the dyke inspection program, under the Inspector of Dykes, is the ensure the safety, proper maintenance and operation of all dykes in the province.

During 1981/82, spot inspections continued to be made in all dyking districts in the Lower Fraser Valley.

The wet spring and summer in 1981 resulted in minor flooding in Dewdney and Matsqui due to rainfall exceeding the design capacity of the pumps.

A close watch was kept on several possible problem areas in the Lower Fraser Valley, notably Carey point, Harrison groyne, Newton Road in Dewdney, Nicomen Island, the east and end of Matsqui near Sumas Mountain and the wing dyke area of Chilliwack.

DAM SAFETY

The dam safety program includes more than 2,000 existing storage structures in the province. Of these, 146 are classified as major structures 67

of which were inspected in the fiscal year 1981/82. In 28 cases the licensees were notified of necessary repairs. The total cost of such repairs required under the dam safety program and carried out by the respective licensees exceeds 4 million dollars for the period 1976-81.

Safety inspections involving intermediate or smaller size dams carried out during the year totalled 270, and 60 of these structures were reported to their owners as being in need of remedial safety measures. Problems of staffing in the regions limited the number of dam inspections in the intermediate and smaller category.

In the majority of cases where specific regulation by water management staff has been necessary, the licensees or other members of the public involved have co-operated without reservation. During the period under review 55 formal engineer's orders were issued under Section 37(1) of the Water Act.

A guide for preparing Operation and Maintenance Manuals was compiled and released on a pilot basis to a number of dam owners. It is intended that such manuals will be required on all major dam structures as an essential component of emergency preparedness planning. Associated instrumentation networks utilizing geotechnical instruments were monitored on 27 potentially high hazard dams on two or more occasions during the year. Dam safety staff also gave related Education Program talks to a number of concerned groups, and provided specialist assistance to stability studies on the Fort. St. John sewage lagoon and the stabilization of Deeks Creek Dam on Highway #99, south of Squamish.

A joint British Columbia, Alberta, and B.C. Hydro and Power Authority task force was formed in 1974 to study and make recommendations on aspects of reservoir regulation which would mitigate the downsteam effects of the G.M. Shrum power station operation. The task force, under the chairmanship of a Water Management Branch staff member, met several times during the year. As a result of their recommendations, flow control measures contributed to a trouble-free breakup in spite of record high volumes of river ice and above average snow cover in the Peace River basin.

WATER SUPPLY PROJECTS

An adequate and economic water supply is essential to community living and agricultural productivity. The activities outlined in the following section are undertaken to ensure water supply systems are designed and operated to the standard necessary to ensure both water quality and quantity.

Studies and Reports

Most water supply projects are undertaken by the staff of the Engineering Water Supply Section; responding to requests for assistance under the Agriculture and Rural Development Sub Agreement administered by the Ministry of Agriculture and Food. This program provides funds for carrying out engineering and economic feasibility evaluation of proposed agricultural development projects, as well as providing funds to assist in construction of approved projects. Water supply and irrigation studies active during the period April 1, 1981 to March 31, 1982 are described in Table 15.

Project Implementation

Project implementation involves both final design and construction supervision and is either carried out by staff of Water Supply Section, or by consulting engineers. The status of active projects during the period April 1, 1981 to March 31, 1982 is described in Table 16.

The Water Supply Section provided engineering services during the year to other branches of the Ministry. These assignments included continuing assistance in carrying out water supply improvements to the Fraser Valley Trout Hatchery, final design of the proposed Hill Creek Hatchery, and preliminary investigations, designs, and cost estimates for an effluent irrigation scheme for the Kamloops Waste Management Task Force.

Public Health Engineering

A major function of the Public Health Engineering Section and Regional Public Health Engineering is to ensure that all new waterworks construction in the province meets the minimum standards of design outlined in the

Section's publication "Waterworks Systems Guidelines", particularly in relation to the protection of public health.

The decentralization of Regional Public Health Engineering staff was completed this year and all but one of the vacancies were filled. The preparation of policy and procedure manuals was started.

Some 937 certificates of approval were processed during the reporting period. This compares with 721, and 861 for similar periods during 1979/80 and 1980/81.

Community Water Supplies

The Community Water Supply Section provides the day to day technical financial and administrative support to the Comptroller of Water Rights in the exercise of his responsibilities under the Water Utility Act and the Utilities Commission Act. This legislation provides water consumers in areas not served by water agencies of local government with assured technical quality standards for community water systems and consumer cost regulation that otherwise might not exist. There were 255 privately owned water utilities and 34 municipal utilities under regulation at March 31, 1982.

In a 12-month period ending March 31, 1982, 75 applications for certificates were received. A total of 79 certificates were issued during the year compared with 68 issued in the previous 15-month reporting period ended March 31, 1981. A breakdown showing the purposes for which these certificates were issued is shown in Table 17. Approval was given to the transfer of ownership fo 19 water systems during the year. Sixteen of these were transferred to improvement districts, municipalities or regional districts while, as noted in Appendix 1, thirteen were transferred to other private owners and continue to be operated under the Water Utility Act.

A total of 150 orders of various kinds were made by the Comptroller compared with 105 in the previous reporting period, and included orders for the establishment of maintenance trust funds, construction trust funds, deferred capacity trust funds, replacement reserve trust funds, and the approvals of the transfer of waterworks to new owners. The trust funds referred to above are deposited with a financial institution of the utility's choice and held there to the order of the Comptroller. At the year end the total balance on deposit amounted to $4,522,029 compared with $4,487,050 held at March 31, 1981.

In the continuing regulation of water utilities, 65 applications were received to file new or amend tariffs including rate schedules, and during the period under review 43 new or amended tariffs were examined and accepted for filing.

The Section continued to provide engineering support to the Ministry of Municipal Affairs in accordance with the protocol agreement made between that ministry and the Ministry of Environment in early 1979. This support takes the form of advice and recommendations to the Ministry of Municipal Affairs and technical support and/or guidance to improvement districts upon requests being made by the ministry.

From April 1, 1981 to March 31, 1982, at the request of the Ministry of Municipal Affairs, the technical aspects of 88 by-laws were examined, recommendations were made on 21 requests for release of special trust funds and the viability and technical implications of seven proposed incorporations and boundary adjustments were examined. Forty-six miscellaneous investigations and reports were made on complaints, enquiries regarding service, subdivision, system extension proposals, supply agreements, system capacity appraisals and well tests. Proposals for major projects were appraised, or engineering studies undertaken for seven improvement districts.

In addition, engineering support was provided in reviewing and making recommendations on 80 applications by improvement districts for financial assistance under the 1981 Improvement District Assistant Program.

WATER QUANTITY

The foundation necessary for water management is an adequate understanding of the amounts of water available in our streams, lakes, reservoirs, and the under aquifers. Flood flow information

is also required for activities ranging from flood warnings to determining the level to which dykes should be built, or how far reservoirs should be drawn down to protect the structures and retain and therefore reduce subsequent high flows.

Groundwater

The Groundwater Section receives, collects and compiles data obtained from well drilling activities throughout the Province. See Table 18. Variation in the number of water well records received in different years occurs because the submission of these records is made entirely on a voluntary basis. This information is made available to the general public in answer to their enquiries concerning groundwater supplies for domestic and other needs. The data are used by government staff and groundwater consultants in various types of groundwater investigations related to management, development and protection of groundwater resources. All water well data is currently stored in a manually operated system and work is continuing toward a computerized storage and retrieval program for water well data. The number of enquiries answered by Groundwater Section staff totalled 586 and 157 water samples were collected for chemical analysis. A hydrogeological mapping program is continuing for the Saanich Peninsula Pilot Project. Considerable time is used in reviewing environmental impact assessment State 1 and 2 studies, mainland for proposed coal and metal mining projects and their possible effects on groundwater resources. See Table 7.

The Section is currently monitoring groundwater levels and water quality in 139 active observation wells in the province. An in-situ tide guage was field tested in an observation well as a long-term recording instrument. Information is received monthly from several key observation wells and a summary is published in the Snow Survey Bulletin. Work is continuing on a publication of historic observation well data.

The Groundwater Section undertook groundwater supply studies, assessment reviews of aquifer and well performance, resource evaluation, inventory studies and provided assistance on groundwater use conflicts and well interference problems. See Table 19.

Surface Water

The Surface Water Subsection coordinates the operation and expansion of the province-wide network of water level and streamflow guages through the Federal/Provincial Hydrometric Cost-sharing Agreement (1975). During 1981, 22 new stations were added to the network and one deleted giving a total of 643 active stations in the province during the year. These stations were operated by Environment Canada under the Agreement.

In addition, the Section operated a small network of special-purpose hydrometric stations installed for Branch projects. During 1981, 66 of these stations were in operation.

The Surface Water Section also estimated the water quality in various creeks and lakes to accommodate new or expanding water supply systems. See Table 20.

Where sufficient data were available for frequency analysis, the Surface Water Section estimated extreme flood flows and levels by using techniques which included development of regional methods. The most important studies are listed in Table 20.

Storage Inventory

Since the inception of the storage inventory program in 1964, ground surveys have been conducted by the Surveys Section on 147 lakes and reservoirs resulting in the production of 601 maps and drawings. The drafted packages that have been prepared show underwater contours, above water contours, details of storage works, discharge curves, watershed areas and area elevation curves.

An additional 15 reservoirs were surveyed in 1981/82 and a further 38 maps and drawings were produced.

Pesticide Control Program

The Pesticide Control Branch is responsible for ensuring that useful, federally-registered pesticides are used safely in the province in a manner that will not produce an unreasonably adverse effect to people or the environment.

The program controls pesticides by the following seven major objectives or activities:

1. Administering the Pesticide Control Act.
2. Evaluating and issuing permits for various types of pesticide uses.
3. Offering adult extension certification courses on the sale and safe use of pesticides.
4. Establishing standards for and issuing licences to pesticide vendors and pest control services.
5. Conducting inspections and investigations to ensure compliance with the Pesticide Control Act.
6. Supplying the public with technical information on pesticides.
7. Conducting monitoring surveys into pesticide sale and use.

Administration

Regionalization of the program is now firmly in place and appears to be functioning satisfactorily, except that Region 1's Pesticide Control staff is still located in Victoria.

A new version of Regulations to the Pesticide Control Act was published. This version involves major reorganization as well as a reduction in length and clarification of the existing Regulations without any loss in content. To accommodate appeals against permits, permit applications must now be submitted at least 4 months before intended use. Two herbicides, allidochlor and chlorbromuron, were transferred from Schedule IV to Schedule I of the Regulations because of IBT implications.

A system of time management was continued for part of the year for the purposes of auditing the Pesticide Control Program.

The Regional Managers and staff at Headquarters completed several drafts of the Policy and Procedure Manuals.

Headquarters staff were involved in the Federal-Provincial Chlorophenol Task Force which met several times to draft a Code of Good Practice for the use of chlorophenols in sawmills.

Permits

One effective way pesticides are controlled is by the permit system. Use permits are required for pesticides applied to publicly-owned land or to any body of water. Restricted permits are granted for highly toxic or highly persistent compounds listed in Schedule I of the Regulations, and Special Use permits are also granted for certain research permits involving unregistered pesticides.

In terms of the permit referral system, the Branch continued to work closely with members of the Pesticide Control Committee, which is represented by members from the Ministries of Forests, Environment, Agriculture and Food, Health, and Environment Canada. In terms of regionalization, all permits are issued from Headquarters through the Permits Coordinator.

There were 138 permit site inspections made compared to only 52 of the previous year (Table 1), mainly because of the recent emphasis on this type of activity.

These inspections have been examining the potential health concerns of pesticides as well potential environmental effects, as in previous years.

On January 1, 1982, several members of the former Pesticide Control Appeal Board became incorporated into the larger Environmental Appeal Board which is administered under the Environmental Management Act. All pesticide appeals are now under the jurisdiction of the Environmental Appeal Board. During the past year, there were appeals against 40 permits of which none were upheld by the Board.

Certificates

The Branch is heavily involved in training, examining, and certifying pesticide applicators and pesticide dispensers.

The regional staff conducted a total of 85 adult extension courses, somewhat fewer than last year, and issued 5,835 certificates, almost twice as many as last year (Table 1). The reduction in the number of courses is partly related to the de-regulation of pet pesticides from the previous year and the development of "core" courses which will become common to most of the twelve types of courses.

Licences

The four regional offices issued a total of 1,551 licences (992 pesticide vendor licence and 559 pest control service licences which is only slightly down from last year's total of 1,509 (Table 1).

Compliance

The regional staff is involved in enforcing all aspects of the Pesticide Control Act and Regulations. From the 2,109 inspections of the pesticide service and vendor premises, there were 171 investigations, 41 suspensions of licences, and a total of four charges were laid. Table 1 indicates that the number of inspections decreased since last year, but the number of investigations increased.

Occasionally, staff were involved in investigating fatal poisonings of domestic dogs, sick cattle, forestry and farm workers, contaminated drinking water and defoliated trees. In at least half the cases, the cause was not pesticides. Last year staff also investigated several instances of highly toxic compounds being stored or shipped in leaking containers. There were also several reported incidents of pentachlorophenol spills around sawmills.

There were several cases of bee kills throughout the spring season.

As a continuing public service to dispose of unwanted pesticides, pesticides were collected from at least 73 sources.

Technical Information and Publicity

The Branch continues to supply the public with free advice on the safe use of pesticides. A central library of all important pesticide references is being accumulated which will allow this office to act as a "nerve centre" for pesticides information in the province.

Branch staff make a habit of inviting outside speakers to the lectures for adult education courses, and also become involved in acting as guest lecturers themselves. For example, staff were involved in making regular appearances to lecture series sponsored by PEP, the Fire Chiefs of British Columbia, universities and colleges, various forestry pest control committees, various agricultural pest control committees, and various gardening and horticultural community groups.

Stuart Craig, the Regional Manager in Region 8, has arranged with a Penticton radio station to present a 10-minute weekly radio program on pesticides. These programs cover both general areas related to pesticide safety and use as well as regional or local topics of interest. The radio station has broadcasted these programs within all areas of the Okanagan region, primarily directed to the agricultural community.

Special Studies

Work has progressed in developing a computer analysis of data provided in applications for permits. This study will improve staff capability to answer questions from the public and private sectors regarding the occurrence and impact of pesticides in the province.

Regional Operations Division

Most Regional Operations Division activities are described under the various program headings elsewhere in this report.

Provincial Emergency Program

The primary role of the Provincial Emergency Program is disaster mitigation planning. This requires production and maintenance of the Provincial Emergency Plan, the coordination of planning and, as needed, emergency response for 22 ministries and Crown corporations.

The Program encourages similar planning within municipalities of the Province and coordinates intermunicipal planning and response to emergencies in Provincial jurisdiction and the municipalities as required.

Training officers conduct courses for provincial and municipal employees in a wide variety of subjects from search and rescue and general emergency planning to seminars on the Transportation of Dangerous Goods Code.

Through its six regional offices, the Program provides administration, training, and limited equipment to volunteers who are engaged in all types of land, sea and air rescue and other community emergency needs. These include search and rescue, vehicle accidents, floods, slides, storms, dangerous goods spills and of late, volcanic eruptions. In 1981, 1,191 training and operational tasks were performed.

The Program also serves as lead agency for the Province in the event of spills of dangerous goods and operates a 24 hour response network to deal with all types of natural or man-made emergencies.

EMERGENCY PLANNING

During 1981, there was continued revi-sion of the Provincial Emergency Program Plan and progress in planning at the municipal level. The ministries of the province deserve credit for continuing assistance in the preparation of their individual plans.

At the international level, the planning for the possible eruption of Mt. Baker is nearing completion.

The Program is also engaged in inter-agency agreements at the Federal and Provincial level. Currently underway are agreements between the Fisheries and Department of Indian and Northern Affairs.

TRAINING PROGRAM

The training section is responsible for developing and conducting a Provincial Course Program on emergency planning subjects. These courses are held at the Provincial College in Victoria and at numerous locations throughout the Province. Supplementing the Provincial Program are many local courses conducted by the Municipal Emergency Organizations. Local courses are under the auspices of the Provincial Director of Training.

The Provincial College offers courses dealing with community emergency planning, transportation of dangerous goods, marine rescue, management of land searches, casualty simulation, oil spill control, techniques of instruction, cliff rescue and tracking. In 1981 community planning continued to be emphasized through training of municipal and elected officials in this subject.

The Program continued to offer a Dangerous Goods Trainers Course. This course prepares training officers in response organizations, such as Fire Services, Police, Ambulance and Municipal Engineering. The Provincial Emergency Program also conducted Awareness Seminars in virtually every municipality in the province.

The Search Management Course was developed during 1980 to train selected key search and rescue personnel from each municipality in B.C. During 1981, 22 nominees were trained in this subject. Continued work has been done in techniques of Cliff Rescue and Tracking Courses throughout the province.

The Provincial Emergency Program is a nominating agency for Federal Emergency Planning Courses at Arnprior, Ontario. British Columbia continues to have a strong interest in these federal courses, most of which are over subscribed.

During 1981, 5,341 persons received Provincial Emergency Program instruction.

SEARCH AND RESCUE OPERATIONS

AIR SERVICE

The Air Service assists the Armed Forces in air searches and also in marine and land search operations. Over 1,066 volunteer pilots and spotters are registered in the Air Service and fly over 300 aircraft in locations throughout the Province. During the reporting period, the Air Service was involved in 43 operational tasks, and volunteers donated 4,869 manhours.

Training exercises are held in each region of the Province in conjunction with the Armed Forces to develop and maintain our highly effective Air Service. These volunteers are truly dedicated people, both in their training and performing assigned tasks.

MARINE SERVICE

The Marine Service is dispatched by the Rescue Coordination Centre, local police and Municipal Area Coordinators to rescue boaters in distress or assist land and air searches where required. The number of marine incidents during this reporting period totalled 582. The service presently has 338 vessels registered and manned by over 489 volunteers. Highly motivated volunteers donated 6,939 hours on operational tasks and many times this in training.

LAND SEARCH AND RESCUE SERVICES

Search and rescue in B.C. is a very diversified task. Volunteer search and rescue teams get involved in bush searches, and in highway rescues, usually where extrications are needed, or where a vehicle is over a cliff and special means are required to reach the victims. Other groups are trained in cliff rescue, aiding lost or injured recreationists.

Tens of thousands of hours are expended annually on volunteer search and rescue tasks and unaccountable hours on training and preparations. During 1981, 288 tasks were completed.

COMMUNICATIONS

Communications play a major role in any emergency situation. While we tend to rely on our regular communications facilities such as telephones and telex during non-emergencies, these may not always be available. The Provincial Emergency Program with the cooperation of most other ministries has been working toward establishment of a province-wide emergency communications network. Improvements in exercises have been undertaken with Provincial Emergency Program's own Base Station, VE7 PEP.

AUXILIARY AND RESERVE POLICE

The Provincial Emergency Program makes possible the training of Auxiliary and Reserve Police. Regular police departments are becoming more dependent on auxiliaries who assist in emergencies such as search and rescue. It is interesting to note that we are one of the few provinces with such a system, however, other provinces are now following our lead. Currently there are 1,357 volunteers enrolled in this program.

DANGEROUS GOODS INCIDENTS

The Provincial Emergency Program recorded 496 incidents involving oil and other dangerous goods in 1981, an increase of 7% over 1980. Of the reported incidents, 61 were motor vehicle accidents, 10 were train derailments, 80 were from equipment failure, 88 from human error, 8 from vandalism and 17 from marine. One hundred and fifty "slicks" were reported with the most frequent spilled product being diesel fuel. Minor poly-chlorinated biphenyl (PCB) spills totalled 24.

A Special Thank You

The Provincial Emergency Program crosses ministerial boundaries in a manner unlike any other provincial organization. With a small staff of 38 regular employees, it would be difficult to accomplish our mission without the dedicated support of 8,351 volunteers and the willing cooperation of representatives of the other ministries of the provincial government. We are also greatly indebted to the 109 Area Coordinators who are indeed the backbone of the system. Our heartfelt thanks to all these people who make this most worthwhile public service possible. Their recorded efforts in 1981 show 1,803 lives removed from jeopardy and the saving of $5.6 million in potential property damage.

Assessment and Planning Division

Terrestrial Environmental Management Program

The goal of this program is to develop and implement a program which promotes the sensitive and orderly planning, assessment and management of British Columbia's terrestrial environments in the long-term based on an understanding of the natural attributes of these environments.

Objectives

1. To develop and deliver a province-wide program of professional and technical environmental advisory services so that decision-makers and the general public may be provided with factual information and educational material regarding terrestrial habitats and resources.
2. To develop, coordinate and guide provincial terrestrial environmental policies and programs in and between all agencies and levels of government so that quality habitats for plants, fish, wildlife and humans are maintained.
3. To establish and coordinate planning and assessment processes for terrestrial ecosystems and resources and to administer such environmental review processes as are supported by policy or legislation.
4. To develop and set provincial procedures and standards for data collection and analysis of terrestrial habitats for a variety of planning, assessment and management purposes and to cooperate with other governments and agencies in the maintenance and sharing of quality data.
5. To prepare, maintain and publish development siting guidelines that are sensitive to the physical, biological, economic and social characteristics of terrestrial environments.
6. To encourage integrated resource use and management in keeping with the ability of terrestrial systems to support such use and in the context of regional economics and social goals.
7. To provide incentives to private individuals, groups and agencies who manage, protect and restore terrestrial environments.
8. To conduct research to ensure the development of new knowledge when needed to meet program goals and objectives.

ADMINISTRATION

The 1981/82 budget for the Terrestrial Environment Management Program was $6.3 million with approximately 72% allocated to salaries, 26% to supplies and services, and 2% to capital expenditures. This funding provided for services by 133 regular professional, technical and administrative employees, plus auxiliary employees to meet program requirements.

The main thrust of the program was provided by the Assessment and Planning Division of the Ministry in Victoria, with particular activities related to North East Coal development being carried out by the Prince George office of the Regional Division.

It should be noted that, as the Assessment and Planning Division is structured such that all administrative support services to branches are provided from a centralized service group, the administrative costs for the Terrestrial Environment Management Program also provide for service to the Coastal and Estuary Management Program, and the Air Management Program, both of which are carried out essentially by the Division.

There are four branches in this Program: Assessment Branch, Aquatic Studies Branch, Planning Branch and Tererestrial Studies Branch.

ASSESSMENT BRANCH

The Assessment Branch is primarily responsible for the conduct and coordination of technical reviews pertaining to environmental management of major development projects. These responsibilities are administratively divided between two sections.

Evaluation Section

ENERGY REVIEW PROCESS

The Branch is closely involved with the Energy Review Process as a member of the Energy Project Coordinating Committee and Chairman of the Environment/Resource/Land Use Working Committee. Ministry of Environment and other provincial agency comments on each proposal are coordinated and presented to the E/R/LU Working Committee as part of the overall review process. Projects reviewed under this process in 1981/82 included: Kelly Lake - Cheekye Transmission Line, Natural Gas Allocation Program, Vancouver Island Natural Gas Pipeline and Hat Creek Thermal Generation.

FEDERAL GOVERNMENT INITIATED PROJECTS

The Branch serves as provincial representative on major proposal reviews initiated by the federal government and is responsible for coordinating the presentation of provincial environmental interests in relation to each project. Projects which were handled in this manner during 1981/82 included: Canadian National Railway Twin-Tracking and Vancouver International Airport Expansion.

Guidelines and Review Section

METAL AND COAL MINES REVIEW

The assessment Branch represented the Ministry on the Provincial Coal Guidelines Steering Committee and Metal Mines Steering Committee in the review of projected coal and metal mine developments under established provincial guidelines. The objective was to coordinate the Ministry review of proposed developments, to develop a consolidated position in cooperation with the Regions, and the present this position as required to the Ministry Executive, and to the appropriate inter-ministry Steering Committee for approval by the Environment and Land Use Technical Committee. Major project reviews underway in 1981/82 included some 50 projected developments such as Quinsam Coal, Westmin Resources, Sage Creek Coal and Fording Coal.

The Branch provided assistance to North Region, Ministry of Environment, in the continuing environmental review of projected North East Coal developments.

LINEAR ASSESSMENT AND REVIEW

The planning of electrical transmission lines, pipelines, highways and major resource roads continued to place heavy demands on Ministry staff. The Branch worked closely with Ministry staff, the Ministry of Energy, Mines and Petroleum Resources, other resource agencies and energy project proponents in securing environmental safeguards for five new high-voltage transmission lines, the proposed Vancouver Island gas pipeline and three highway and resource road proposals.

The Utilities Commission Act (1981) accommodated many of the major linear project types formerly reviewed under the Guidelines for Linear Development. The Branch was responsible for the administration of the latter on an inter-ministry basis, and for liaison with the Regional Resource Management Committee as to project-review designation under Guidelines or under regional referral. The objective was to provide an inter-ministry framework, operating under updated Guidelines, for the Provincial review of linear projects not covered by the Utilities Commission Act.

SURVEILLANCE AND MONITORING

In cooperation with developers and government agencies, the Branch is responsible for establishing procedures and standards for project environmental surveillance, supervision and monitoring programs for all stages of a resource development. During 1981/82, activities included preparation of standard procedures for environmentally sensitive construction practices (e.g., stream crossings), development of procedures for environmental surveillance and supervision of major development projects (e.g., Pacific Northern Natural Gas Pipeline, Alaska Gas Pipeline Southeastern, and C.N. twin-tracking), and development coordination of monitoring programs for major projects (e.g. Alaska Natural Gas Pipeline).

AQUATIC STUDIES BRANCH

In 1981/82, a number of environmental impact assessments and water quality studies were performed.

Environment impact assessment reviews were performed on about 45 proposed developments to support the

Assessment Branch in interpreting the potential impact on water quality and aquatic life. These included coal mines such as Hat Creek, and Monkman Coal projects, metal mines, hydroelectric projects and petrochemical projects proposed under the Natural Gas Allocation Process.

Aquatic Studies Branch continued to perform a number of services including inventory and mapping, development of inventory and data storage methods, data entry and review, lake and watershed management studies and aquatic plant management.

In 1981/82, 85 lakes were surveyed and 5 stream watersheds were inventoried. Bathymetric mapping conducted over some 32 years has now been microfilmed in preparation for duplication and distribution to regional offices. A new computerized program for preparing lake outlines and plotting soundings from field data has been put into operation. Also, a three volume set of reports detailing studies of proposed stream crossing sites for the Alcan Gas Pipeline project was completed. Reviews of existing data files have been carried out to provide data to assist in the Ministry's strategic planning process.

Procedures for the B.C. Aquatic Data Base were finalized during the 1981/82 and inventory data were added to it from the East Kootenay and North East Coal Block areas. The data base now contains over 9,000 reach, point or fish sample records for over 1,000 watersheds. Three procedures were added to the standard methods used in aquatic system inventory: channel stability evaluation, indirect flood frequency analysis and basin morphometry. These are being applied in the Queen Charlotte Islands and four interior watersheds as a part of land planning at both strategic and operational levels. A procedure for strategic level minimum flow analysis for fish is under development. Sample design and data entry support was provided for seven major operation inventories conducted by the Ministry of Environment, as well as numerous consultants, the Yukon Territorial Government and smaller projects. About 15 requests per month for aquatic data or inventory methods were processed.

Lakes studies included: Investigations of water quality problems in lakes being used for water supply, recreation and irrigation. Reports were published on studies of Blackburn, Bullock's, Ford and Stowell Lakes on Saltspring Island, Fuller Lake near Chemainus, Elk Lake near Victoria, Garnet Reservoir near Summerland and Dutch Lake near Clearwater. Studies were initiated also on Buttle Lake near Campbell River and on St. Mary and Maxwell Lakes on Saltspring Island. Over a dozen other lakes are being studied following requests for advice to solve water quality problems.

A data review was initiated to measure the sensitivity of British Columbia lakes to acid rain.

The Mackenzie River Basin intergovernmental study was continued, and this watershed management study showed that the Liard River which flows through northeastern British Columbia can contribute up to 70 percent of the flow in the Mackenzie River at peak flow. Since drainage from British Columbia contributes 25 percent of the annual flow in the Mackenzie River via the Peace and Liard Rivers, future development in British Columbia can affect the hydrologic system in the Mackenzie River Basin.

The aquatic plant management program continued to concentrate on control of Eurasioan water milfoil (Myriophyllum spicatum L.). This aquatic weed is a major nuisance in the Okanagan Valley lakes, and is present in a number of locations in the Lower Mainland and in one lake in the Kootenay region. Also, colonies of this plant were located for the first time in Shuswap Lake in 1981, and an emergency diver-operated dredging program attempted to control the small populations and reduce further spreading. Extensive surveys of non-infested lakes were continued and three roadside quarantine stations were operated in order to minimize spread of Eurasian water milfoil by boaters.

In 1981, most operational control projects to relieve aquatic weed nuisances were performed by local agencies with technical advice, equipment and 75 percent funding provided by the province under agreements for cost sharing. The Ministry of Environment continued

to monitor the environmental impacts and ecology of Eurasian water milfoil and to assess and document mechanical and chemical control technologies throughout the province.

Table 1 provides details on these activities.

PLANNING BRANCH

The main role of the Planning Branch is to prepare strategic environmental plans for some 40 sub-regions of the province and to provide economic expertise to support all other programs across the Ministry. During 1981/82 fiscal year, the Branch recruited the majority of its 15 established positions, so it did not become fully operational until the end of the year.

Strategic plans involve all programs and require coordination of staff in both regions and Victoria-based branches at the policy and operational levels. These plans are designed to enable the Ministry achieve its management objectives for each resource program under its mandate through an analysis of management options to balance supply with demand for all environmental resources over a 20-year period. Because the process involves a major change in Ministry tactics from those of regulation and allocation of resources on a site-specific basis to a broader based resource management strategy, much of the existing Ministry information has to be reviewed and analyzed on a sub-regional basis. Accordingly, during the first six months of the year a Ministerial Working Group, coordinated by the Planning Branch developed the framework for an improved information system to support strategic planning. As a result of this work, the Ministry Executive created an Information Systems Committee to develop a more detailed information system to support all Ministry activities at the regional, sub-regional (strategic) and operational (site-specific) levels.

The Planning Branch has progressed in the preparation of its first five plans for the Nicola basin, Elk-Flathead, Finlay-Ominsca, Peace and Upper Columbia. Regional economic profiles of current and projected development activities and population growth have been initiated for each of the eight Resource Regions of the Province and in the case of the first two plans, 20-year forecasts of resource use have been made and management measures required to meet these demands have been evaluated.

To ensure these strategic plans reflect public concerns and aspirations, the Planning Branch has drafted a process for public consultation. This approach will be flexible, adapting to the different conditions that exist in each sub-region and will directly involve the regional staff of the Ministry. It will be designed to permit members of the public to influence future management decisions that are incorporated into the strategic plans.

Because Ministry plans must eventually be integrated with those of other ministries and levels of government, the planning Branch has spent considerable time liaising with other government bodies. The Planning Branch represented the Ministry in developing an inter-ministry plan coordination process that is proposed in the Land Use Act. This Act was presented to the Legislature in December 1981 and is still under discussion. The Branch has also had discussions with the Federal Ministries of Fisheries and Oceans and Environment to encourage cooperation in technical analysis and data exchange.

A number of inter-ministry studies were undertaken during the year. Two were in the Kootenay Region, in the Slocan Valley and Columbia-Windermere Lakes area and involved the Regional Resource Management Committee and the appropriate Regional District. Both plans were designed to produce an integrated resource management plan for land and water use. In both cases, ministry coordination was provided from this program; in the case of the Slocan Study through the Terrestrial Studies Branch and in the Columbia-Windermere Lakes Study through the Planning Branch.

TERRESTRIAL STUDIES BRANCH

The Terrestrial Studies Branch provides resource information basic to planning, assessment and management in the fields of soils, surficial geology, vegetation, wildlife biophysical habitats and present land use. The Branch

serves as a central repository for province-wide information on soils, vegetation and terrain, and provides drafting, graphics, autocartographic and map library services for the Assessment and Planning Division. Work is done in response to requests from the various Regional Offices and Branches of the Ministry of Environment. Information is also provided to other Ministries as a byproduct of the above activities or directly where funding and/or bilateral work agreements are in place.

A variety of projects were undertaken for the Ministry of Environment mainly related to Strategic Planning, Environmental Impact Reviews and Wildlife Habitat assessments. Information was also provided to the Ministry of Agriculture and Food on Soil Capability for Agriculture, and to the Ministry of Forests as part of their public involvement process in problem areas.

The following area some of the more significant tasks undertaken and achievements reached during the 1981 reporting period:

1. Reorganization of the Branch to better accommodate the planning and assessment needs to the Ministry.
2. The development of a centralized computer system to store, access and manipulate soils data. This system makes soils data readily available to all interested ministries.
3. The development of a computer system for the laboratory in which chemical and physical data can be easily entered and manipulated. The system eliminates the need of manual calculations and thus increases the efficiency and output of the Laboratory. There is a linkage between the soil and laboratory systems for easy transfer of data.
4. Completed the installation of a computer mapping system in which to store soils, terrain, vegetation, agriculture and wildlife capabaility maps. Again the objective is to increase the rate of map production and to facilitate the manipulation of map data to produce new maps useful to planning and management.
5. Continued the broad scale assessment of the soil, terrain, vegetation and wildlife capability resources in the Dease-Stikine Planning Unit.
6. Completed an aerial wildlife census of the Dease-Stikine Planning Unit.
7. Developed standards and procedure manuals for: Soil Capability for Agriculture Ratings, Terrain Classification, Wildlife Biophysical Habitat Classification, and Soil Capability for Forage Production.
8. Completed the soil and agriculture capability assessment of 30,000 hectares on the east coast of Vancouver Island between Ladysmith and Nanaimo.
9. In cooperation with the Fish and Wildlife Branch, the Ministry of Forests and the Provincial Museum, initiated development of a generalized Wildlife Habitat Handbook and an associated Biotic Regions Map.
10. As input to the Kamloops Waste Management Task Force Studies, identified potential areas suitable for effluent spray irrigation.
11. Completed input to a coordinated resource analysis of the Tahsish-Kwois area in response to a request from the Ministry of Forests.
12. Completed the assembly of seven resource maps and the compilation of a technical report as input to the Slocan Valley Planning Program. This is an ELUC sponsored program designed to address a number of long-standing resource allocation and management issues, e.g., the Valhalla Park proposal and the integrated use of watersheds and forest land.
13. Completed the publication and distribution of 57 new reports prepared by the Assessment and Planning Division. Examples of publication titles include: Soils of the Langley-Vancouver Map area (Volumes 1,2,3,6), Terrain and Geological Hazards: Northern Vancouver Island, Assessment and Planning Division Catalogue (lists all published maps and reports).

NORTH EAST COAL DEVELOPMENT

The Ministry of Environment has developed a coordinated program to management the environmental impacts of coal development in northeastern British Columbia. Additional staff have been employed to assess, inspect and monitor the many activities associated with the planning, construction and operation of several mines, a new town, a railway, highways, and hydro and gas transmission lines. The major objectives of the program are to ensure

the environment is adequately protected and that the necessary permits, licences and approvals are issued promptly following the submission of all necessary supporting information.

Table 1
AQUATIC PLANT MANAGEMENT PROGRAM

Quarantine and Surveillance
- 3 stations checked 13,000 boaters
- Eurasian water milfoil found on 218 boats, motors or trailers
- 32 intensive plant surveys
- 100 water bodies examined
- Eurasian water milfoil found established in a number of sites on Shuswap Lake

Public Information
- five minute video display produced and shown
- printed material distributed widely from a variety of public places including shopping malls
- 10,000 quarantine cards distributed by the publication Vancouver Island Visitor at ferry terminals
- pamphlets and new warning posters provided to ferries and all tourist information outlets
- 2500 quarantine cards distributed by Parks Canada and Canada Customs
- warning signs placed at strategic access locations in the province and in Alberta and Washington

Herbicide Treatment and Evaluation
- 2,4-D applied to 6 hectares of Osoyoos Lake in the enclosed Solano Bay under permit obtained by Okanagan Basin Water Board
- assisted Ministry of Lands, Parks and Housing in treatment of one-half hectare in Champion Lake
- major applications of 1980 achieved good control
- spot applications of 1980 yielded variable results.

Mechanical Treatments and Evaluation
- all work under cost-shared agreements with Okanagan Basin Water Board or Regional Districts
- 150 hectares in Wood, Skaha, Okanagan, Vaseux and Osoyoos Lakes were either harvested or tilled
- tillage has proved to be better and less expensive.
- Cultus Lake control was successful with a combination of dredge, rotovator and bottom barriers
- Salmon Arm in Shuswap Lake was treated with a diver-operated dredge and bottom barriers.

Biological Studies
- alternate biological controls continue to be investigated.
- all aspects of life history and seasonability are continuing to determine vulnerability.

Coastal and Estuary Management Program

The goal of this program is to develop and implement a program which promotes the sensitive and orderly planning, assessment and management of British Columbia's coastal and estuarine environments in the long term based on an understanding of the natural attributes of these environments. The objectives are as follows:

1. To develop and deliver a province-wide program of professional and technical environmental advisory services so that decision makers and the general public may be provided with factual information and educational material regarding coastal and estuarine habitats and resources.
2. To coordinate coastal and estuary policies, legislation and programs in and between all agencies and levels of government in the interest of providing a quality habitat for plants, wildlife, fish and humans.
3. To establish and coordinate planning and assessment processes for coastal and estuarine ecosystems and resources and to administer such environmental review processes as are supported by policy or legislation.
4. To develop and set provincial procedures and standards for data collection and analysis of coastal and estuarine habitats for a variety of planning, assessments and management purposes and to cooperate with other governments and agencies in the maintenance and sharing of quality data.
5. To prepare, maintain and publish development siting guidelines that are sensitive to the physical, biological, economic and social characteristics of coastal and estuarine environments.
6. To encourage integrated resource use and management in keeping with the ability of the coastal or estuarine systems to support such use and in the context of regional economic and social goals.
7. To encourage a cooperative approach by agencies and governments to the management of coastal areas and estuaries.
8. To provide incentives to private individuals, groups and agencies who manage, protect and restore coastal and estuarine environments.
9. To conduct research to ensure the development of new knowledge where needed to meet program goals and objectives.

ADMINISTRATION

The Coastal and Estuary Management Program budget in 1981/82 was approximately $976,000, of which roughly $681,000 was allocated to salaries, $280,000 to supplies and services, and nearly $16,000 to capital expenditures. This provided salaries and operating expenses for 11 regular employees and necessary auxiliaries.

The program was carried out in the Assessment and Planning Division of the Ministry, in Victoria. The Planning Branch was not involved in plans encompassing coastal or estuary areas in this fiscal year. Assessment Branch had a number of important Coastal Estuary activities as did Aquatic Studies Branch and Terrestrial Studies Branch.

ASSESSMENT BRANCH

The Assessment Branch is primarily responsible for the conduct and coordination of technical reviews pertaining to environmental management of major development projects. These responsibilities are administratively divided between two sections.

Evaluation Section

PRELIMINARY ENVIRONMENTAL ASSESSMENT/ ENVIRONMENTAL PROBLEM ANALYSIS

The objective is to identify and assess the broad environmental consequences of major development proposals at an early stage in the planning process. The results of these evaluations contribute to the development of a Ministry position regarding the proposal and the determination of the most appropriate type and level of further

environmental assessment, if warranted. Projects reviewed by this process in 1981/82 included Offshore Petroleum Exploration and Development, and Tsehum Harbour Marine Development.

ORDER-IN-COUNCIL ADMINISTRATION and ESTUARY MANAGEMENT PLANNING

The Branch is responsible for the administration of Orders-In-Council 908/77 and 3339/77 which provide for mandatory environmental impact assessment of all development proposals in the outer Fraser and Cowichan estuaries, respectively. In addition, the Branch participated in the development of the Fraser, Cowichan and Squamish estuary management plans through the provision of resource planning assistance. As Implementation Coordinator, the Branch has assumed the lead role in the implementation of the recommendations of the Cowichan Estuary Task Force Report, including the establishment of an office in Duncan.

FEDERAL GOVERNMENT INITIATED PROJECTS

The Branch serves as provincial representative on major proposal reviews initiated by the Federal government and is responsible for coordinating the presentation of provincial environmental interests in relation to each project. Projects which have been handled in this manner during 1981/82 included the Roberts Bank Port Expansion, and the Fraser River Training Works.

ENVIRONMENTAL LIAISON

The Branch participates in a number of committees intended to increase the Ministry's awareness of environmental issues and to provide a forum for our input into the resource assessment and operational planning activities of other groups. During 1981/82 Branch involvement included representation on the Sea Use Coastal Advisory Board, Coastal Planner's Group, Port of Vancouver Master Plan, Marine Traffic Advisory Council, Pacific Sub-committee on Oceanography, and the Estuary, Foreshore and Water Log Handling and Transportation Study.

AQUATIC STUDIES BRANCH

Environmental impact assessment reviews were done on about 45 proposed developments to support the Assessment Branch in interpreting the potential impact on water quality and aquatic life. These included some coastal metal mines petrochemical projects proposed under the Natural Gas Allocation Process.

Specific studies relating to water quality included:

1. A report of the Iona Island Sewage Treatment Plant Study Group recommended improving primary treatment and discharging the effluent from the Iona plant into deep water beyond Sturgeon Bank. Source control and a program for further improvements to environmental quality, depending upon results of environmental monitoring, were also recommended.
2. The Fraser River Estuary Study completed the phase dealing with assessment of water quality with the publication of a summary report, 11 background reports and 4 ancillary reports. Also, a follow-up program of storm water monitoring in a residential catchment area draining to the Fraser River was completed. A report on this work is in preparation. Inconsistent results from bioassays performed on effluents discharged to the Fraser led to the formation of a committee to standardize bioassay procedures. The committee is due to report its results in 1982.

The Management Program plan and several supporting reports were completed in March 1982 by the Planning Committee. At year-end, arrangements were being made for a process to recruit public response for consideration by the provincial and federal ministers of Environment.

Work was begun in March, 1982 by a federal/provincial committee of experts on the design of an aquatic environmental quality monitoring program for the estuary.

3. A water quality monitoring plan was prepared to investigate the cause of declining oyster harvests in Ladysmith Harbour. The plan involves provincial, federal, local and private agencies, and is due to be implemented in 1982.
4. The Planning Committee of the Squamish Estuary Management Plan chaired by the Director, Aquatic Studies Branch, completed the draft Management Plan and initiated a public review

process in March, 1982. The final version is expected to be completed by October, 1982.

TERRESTRIAL STUDIES BRANCH

The Terrestrial Studies Branch provides resource information on soils, terrain, vegetation, wildlife biophysical habitats, waterbird census and present land use which is useful for strategic and operational planning and for assessment and management purposes. The Branch also provides drafting, graphic and map library services of the Assessment and Planning Division and serves as a central repository for province-wide information on soils, vegetation, terrain and waterbird census. Work is done in response to requests from the regional offices having coastal resource responsibilities, and from the various branches of the Ministry of Environment.

Projects undertaken in 1981 were mainly in response to regional requests to assist in resolving management problems and to continue to waterbird inventory which was originally undertaken in cooperation with Ducks Unlimited. The more significant accomplishments included:

1. Continued participation in the area Designation Task Force, Fraser River Estuary Study, and in addition, provide:
   a. Estuarine habitat maps of the entire estuary, comprising five maps at 1:25,000 scale to assist in developing the management plan by providing a biophysical resources framework.
   b. A draft estuarine habitat map at 1:5,000 scale for the Middle Arm of the Fraser River as part of a pilot study to assist the Fish and Wildlife Regional Office and Canada Fisheries and Oceans with making management decisions.
   c. Cartographic support for the preparation of Task Force Reports and for the Public Participation Program.
2. Completed intertidal estuarine habitat mapping for seven areas, and prepared a draft methodology of the mapping system.
3. Conduct a waterbird inventory on approximately 10,000 km. of shoreline.
4. Completed an operational management plan for Delkatla Slough, Queen Charlotte Islands.
5. Continued the development of a computer-compatible physical coastal classification system and broad scale testing of the system on south Vancouver Island.
6. Completed a detailed physical coastal classification of Hardy Bay as input to the preparation of a development plan.
7. Published and distributed 10 new reports prepared by the Assessment and Planning Division. Titles included:
   a. Oil Tanker Traffic: Assessing the Risks for the Southern Coast, Vancouver Island.
   b. Killer Whales and Coastal Log Management: An Overview of Future Uses of Robson Bight.
   c. Squamish Estuary Management Plan (Volumes 1 & 2).

Air Management Program

The Air Management Program became operative in 1981/82. There were staff appointments in a number of key positions in both headquarters and regions. All the regional operations were decentralized during the year, however, significant delays were encountered in filling some of the new positions and at year's end several remained vacant.

The Program goal is to ensure a clean and healthy atmospheric environment in British Columbia, through these objectives:

1. Documented standards of desirable air quality for various airsheds in British Columbia.
2. Assessments of current air quality conditions, atmospheric capacities and impacts of developments, based on measured data and projections.
3. Recommendations on the issuance of air emission permits, provision of emissions monitoring methodologies and staff training, and staff assistance in emissions monitoring so as to ensure compliance and thereby reach desirable standards.
4. Distribution of air quality and climatology data in usable form.

Objective 1

To establish standards of desirable air quality for various airsheds in British Columbia.

1. The first step toward this new objective was to identify the information required in order to set air quality objectives for individual airsheds, and to indicate the steps by which this can be done as part of the Ministry's strategic planning process. A total of six specific information requirements have been identified: (1) provincial air quality objectives, (2) air pollution emission inventories, (3) air pollution dispersion models, (4) ambient air quality monitoring, (5) cost-effectiveness of emission control, and (6) enforcement procedures. These requirements now guide priorities and new initiatives within the Program.
2. The Program has contributed to the Ministry's planning exercises for the Slocan and the Elk-Flathead; reports are not finalized.
3. The Program provides the province's contiuing input to national air quality objectives through membership on two national committees.

Objective 2

To assess current air quality conditions, atmospheric capacities and impacts of developments, based on measured data and projections.

1. Air quality data were collected at various stations across the province. These stations included 28 continuous gas analysers, 50 analyzers, 50 particulate monitors, 10 manual acid precipitation monitors and 15 continuous wind measuring systems. Additionally, a large qualtity of spot measurements of dustfall and sulphation rate were conducted.
2. A special project was initiated in Prince George for the collection of additional air quality data in cooperation with major industry in the city. In addition to the joint project with industry, the Program will collect additional information in order to provide a better understanding of the air quality in Prince George. The Program conducts investigations of this type, on a priority basis, in areas where the air quality is poor. These investigations produce a better understanding of the problem and are expected to lead to better and more cost-effective decisions on clean-up programs.
3. The operations of 211 climatological stations were coordinated by the Program, collecting a variety of data on temperature, precipitation, wind and solar radiation. The costs for the field operations of 55% of these stations are borne by other ministries and agencies. Of the total number of stations, 28 support water-related issues, 24% are directly attributable to Air

Management, 18% to the Fish and Wildlife Programs, 13% to Agriculture and Food, 9% to North East Coal development and 8% to Forests.
4. Training courses for both air quality and climatological equipment were developed. One set of the courses was provided for both new staff and staff upgrading with a total attendance of 22.
5. Program staff assisted with the Ministry's resource studies of the Graystokes and Tahsish areas, and with the Kamloops Sewage Effluent study.
6. Approximately 30 environmental impact reports were reviewed.
7. Acid rain research was coordinated with the other three western provinces and Environment Canada. This includes the preparation of two reports entitled "Summaray of Emissions, Air Quality and Meteorology for the Peace Region" and "Standarad Method for the Sampling and Analysis of Precipitation". All acid rain and related activities in western Canada are summarized in a joint publication by the five governments, entitled "Western Canada LRTAP Activities, Annual Report 1981".

Objective 3

To make recommendations on the issuance of air emission permits, to provide emissions monitoring methodologies and staff training, and staff assistance in emissions monitoring so as to ensure compliance and thereby reach desirable standards.
1. In 1981/82 the Air Management Program commenced reviews of air pollution permits which are issued by the Waste Management Program. A total of 25 were reviewed in the last three months of the year.
2. Computer access was obtained to all air pollution dispersion models routinely used by the Environmental Protection Agency of the United States. One meteorologist attended training courses for the use of these models and other models available in Canada, and a limited amount of testing was conducted with the models.
3. Computer programming was initated for the first provincial emissions inventory of sulphur dioxide.
4. In support of the emissions monitoring to be conducted by the Waste Management Program, Air staff prepared first drafts of a provincial code for monitoring emissions of particulates and an operations and training manual for stack sampling equipment. At year end these draft manuals were being edited.
5. A total of five training courses were provided for smoke opacity monitoring. A total of 179 attendees included staff from industry as well as from the Ministry.
6. In conjunction with the Ministry of Transportation and Highways, and Environment Canada, emissions tests were conducted on 400 automobiles in Vancouver. A report on the findings is in preparation.
7. Expert assistance was provided to the Waste Management Program for two major air emissions issues including support at the Environmental Appeal Board hearing into Amax emissions.
8. Also in support of the Waste Management Program, a special stack sampling method was developed and published in a report entitled "The Determination of Mercury Source Emissions in the Presence of High Levels of Sulphur Dioxide".

Objective 4

To distribute air quality and climatology data in usable form.
1. Climatological data available on our computer files were listed in the first "Catalogue of Provincial Climatological Stations, 1980".
2. The "Climate of British Columbia 1977" was published and at year's end the 1978 edition was being printed.
3. Other publications included "A Summary of Climatic Regimes of British Columbia", a revision of "Climatic Capability Classification for Agriculture in British Columbia", "Atmospheric Corrosion Rates Near Typical Forest Industries of B.C.", and three papers published in scientific journals.
4. A total of 51 maps of climatic parameters were prepared including Climatic Capability for Agriculture, Freeze-Free Periods, Growing Degree Days, and Climatic Moisture Deficit.
5. Staff responded to a total of 398 requests for climatic data and interpretations of which 75% were from the general public, 20% from provincial government ministries, and the remaining 5% from a variety of other data

users.

6. Computerized data analyses were initiated for five high priority areas for the Provincial Agricultural Land Commission.

Environmental Laboratory

The Environmental Laboratory continued to provide services for chemical and biological analyses of environmental samples to all provincial ministries and a special water analysis service to the general public. During the reporting period the Environmental Laboratory performed 170,963 routine tests. The Water Quality Check Program provided analytical service for testing of private water supplies to 1071 residents of British Columbia.

The Regional laboratory in Kamloops continued to provide analytical services and instrumentation services to the Thompson Nicola Region.

During the fiscal, detailed plans were initiated for a new Laboratory building. Unfortunately, because of fiscal restraint, the Discovery Park Site at B.C.I.T. which was originally chosen was dropped. Studies for the Laboratory building are continuing.

A new computer system was approved and funded to replace the antiquated system currently operated by the Laboratory. It is expected that this will be in place and fully operational by early 1984.

Considerable effort was placed in improving the legal capabilities of both field and laboratory this year. Legal seminars were given in all Regions and a new legal Sampling hand book was prepared.

The Director's position was filled April 13, 1981 by Dr. R. B. Swingle.

SPECIAL SERVICES DIVISION

The Special Services division continued to provide analytical services related to both the determination of air quality and the biological examination of water. These services were provided to all government ministries requiring them.

During the fiscal year the Biology Section reported 14,000 identifications related to the Taxonomy of fresh water plankton and invertebrates. Provision was made to provide fish bioassay through an arrangement with the Environmental Protection Service of the federal government and 78 fish bioassays were done. In addition to these the Biology Section completed work on 10 daphnia bioassays and 160 microtoxicological bioassays.

During the fiscal period, the Air Quality Section provided clients with 17,120 test results for ambient air, source emission, soil, vegetation and precipitation samples. In addition, 400,000 data points associated with continuous gas and wind analyzers were reported.

During the same period the Instrumentation Section completed work orders for repair and maintenance to monitoring equipment and the Calibration Section carried out performance audits on air monitoring equipment.

Training courses were held for Stack Sampling and the following projects were initiated during the fiscal:

1. Participated as a member of the Bioassay Task Force in producing 'Guidelines and Procedures for Measuring Acute Lethal Toxicology of Liquid Effluents to Fish'.
2. Chaired the Federal/Provincial Task Force on 'Standard Methods for Sampling and Chemical Analysis'.
3. Participated in a joint investigation with the office of the Fire Commissioner and the R.C.M.P. into two fire deaths.

Reports published during the fiscal were the following:

1. 'Industrial Hygiene Air Monitoring: VGH Daycare Centre'
2. 'Air Contamination Monitoring Survey'
3. 'Determination of Mercury Emissions in the Presence of High Levels of Sulfur Dioxide'
4. 'Calibration and Operation of Measurement Systems Used in Stationary Source Testing'
5. 'Comparison of the Luminescent Bacterial Bioassay with Fish Bioassay (Rainbow Trout)' for determining

toxicity in pulp and paper effluents.

CHEMICAL SERVICES

The Chemical Services Division continued to provide analytical services for testing of water, wastewater, sediments and biological materials for inorganic and organic constituents. These services were provided to all provincial ministries requiring them. During the period the Division performed 139,622 tests. I. Kalnins participated in the Federal/Provincial Task Force project for a compilation of methods used in Canada for drinking water analysis. Projects completed during the fiscal year included:

1. Development of analytical method for trace analysis of pesticides glyphosate and aminomethylphosphoric acid.
2. Refinement and introduction of automated methyl thymol blue method for sulphate determination.
3. Analysis of mushroom dust.
4. Completion of mother's milk project.

Surveys and Mapping Program

The goal of this program is to provide service in all fields of Surveys and Mapping involving public funds and to actively promote and coordinate the orderly and long-term development of these services including the pattern of survey control and map compilation in the province. This goal is met through the following objectives:

1. To maintain a provincial system of survey control including the setting and maintenance of standards and procedures.
2. To develop and administer the base mapping program for the province at the scale of 1:5 000 and 1:2 000.
3. To develop and administer a jointly funded base mapping program with other agencies including the private sector.
4. To develop and implement a computer assisted mapping program to produce cadastral and other overlays.
5. To develop and maintain in current state a data file on base maps and remote sensing within the province in cooperation with other agencies including the private sector.
6. To coordinate requests for base maps and remote sensing from all agencies.
7. To develop and implement automated digital map compilation.
8. To develop and deliver a program of professional and technical advisory services on base mapping and remote sensing.
9. To consult with federal, provincial and other agencies to determine the short and long-term requirements for base maps.
10. To increase public awareness and appreciation of base maps and remote sensing by establishing and administering a province-wide program.
11. To cooperate with federal, provincial and other agencies in the maintenance of data standards and conformity for base maps and remote sensing.
12. To develop and implement a provincial remote sensing program to support the base mapping and environmental programs.
13. To consult with federal, provincial and other agencies to determine the short and long-term requirements for remote sensing.
14. To conduct research to ensure the development of new knowledge where needed to meet program goals and objectives.

This report has been written according to organizational units for convenience. However, the duties and accomplishments can be easily related to the goals and objectives. The latter will be re-written in the next year so that objectives are more measureable and more results oriented. Following is a brief overview of the significant activities of the Program and then more detail is presented under organisational units.

Field Surveys consist chiefly of establishing a network of ground control for mapping, and establishing control points for legal surveys in urban and suburban areas (integrated surveys).

Aerial Photography is concerned with obtaining blocks or strips of photos for mapping and a wide range of interpretive and thematic uses.

Digital Mapping, a new activity, employs the latest computer graphics technology to create maps in digital data form for video display, hard copy output, or dissemination to other computer mapping systems.

Derived Mapping is directed at the production of lithographed colour maps for a side spectrum of users inside and outside of government.

The Base Mapping Program was initiated in 1979 with the object of producing a province-wide series of black and white (monochrome) sheets at scales of 1:20 000 and larger. The 1:20 000 bases are designed mainly for resource mapping while the larger scales serve more intensive uses such as regional and urban planning, property assessment, utility services, and

engineering projects.

Special Project Mapping is directed toward Ministerial requirements for floodplain mapping, environmental assessments, and related special purposes.

Reprographics capabilities of the Surveys and Mapping Program include processing and reproduction of aerial and other photos, black and white "print" maps, film transparencies of various kinds, and offset printing and binding.

Distribution of maps and air photos to the general public and other private and governmental users takes place through the office of MAPS-B.C.

The Program and Planning activity coordinates requests for base mapping, control surveys, and aerial photography so as to achieve optimum cost/benefits in the allocation of fiscal and human resources between governmental (in-house) and private (contract) producers. Contract administration is another element of Programs and Planning.

MAPPING SECTION

The Mapping Section of the Surveys and Mapping Branch is involved in four major elements of the Branch program: Base Mapping, Derived Mapping, Special Project Mapping, and Reprographics.

Base Mapping

Production of a new series of base maps at 1:20 000, 1:10 000, 1:5 000, 1:2 500, and 1:2 000 scales is allocated among several production units, principally the Topographic Compilation, Drafting, Cadastral/Planimetric, and Digital Mapping Units. The Topographic Compilation Unit completed 14 major projects. Five others were underway as of March 31 as noted in Table 1. Technical improvements included acquisition of the program, PAT-M (Package for the Aerotriangulation of Independent Models) for adjusting large blocks of models with minimal restrictions on the position and density of ground control points. PAT-M also enables the selection of auxiliary control such as lake surfaces for levelling. With the installation of rotary encoders on three stereoplotters, all instruments are now capable of direct digitizing of ground detail. Five experienced operators left the Topographic Compilation Unit and were replaced through two internal transfers and three from outside the Ministry. Production was seriously reduced because of the time taken to fill these positions.

Pencil line bases generated by the Topographic Compilation Unit are fair-drawn by the staff of the Drafting Sub-Section. During the year 19 projects were undertaken.

The Planimetric Group was merged with the Cadastral Group to form a new Cadastral/Planimetric Sub-Section. Because of the priority placed on base mapping and the necessary reallocation of staff, production of aerial mosaics was halted in November. As noted in Table 3, work included adding cadastral and planimetric detail to base maps, production of 1:10 000 sheets for the Agricultural Land Commission, adding cadastral detail to 1:50 000 National Topographics Series sheets; and production of integrated surveys indexes. Drafting staff from regional and municipal offices were trained to do cadastral updating and several regional and municipal offices were visited to assess their capabilities to do cadastral revision under a joint cost-sharing agreement. Sheets produced under contract with private industry were also checked for cadastral detail.

The Digital Mapping Unit was established in December, 1981, to commence the task of producing digital maps for the Base Mapping Program.

The system will aid map production and create digital map files for use by the resource ministries and other agencies involved with digital mapping applications.

As of March 31, 1982, some 200 map sheets had been produced for the 1:20 000 scale resource map series, 25 of which contained planimetric detail and 175 cadastral detail.

The staff operating the system were recruited from the Cadastral Plotting and Drafting Sections of the Branch. Organized into two shifts to optimize equipment use, their extensive experience and knowledge of the mapping process contributed immeasurably to the success achieved in applying the system to production operations.

Equipment consists of a small

computer with three 160 megabyte disk storage devices, a tape drive, five dual screen graphic work stations, and the first Versatec electrostatic film plotter installed in Canada. The last piece of equipment is capable of outputting a hard copy map from digital files in less than one minute.

Future plans include a system upgrade to a 32-bit interactive virtual memory computer with the performance characteristics of a large-scale machine. This will enable the doubling of digital map production and the development of digital photogrammetric compilation to obviate manual digitising of base manuscripts.

Derived Mapping

Fifteen new and revised lithographed maps were published (see Table 2). Another 19 were reprinted to replenish stocks depleted by distribution. The new CR-1 (Bowron Lake Park Canoe Route) was printed on special waater-resistant paper for outdoor use. New small scale maps of the Province include L7 at 1:2 000 000, map ICK also at 1;2 000 000, and a series of 17 administrative maps at 1:5 000 000.

There were 49 rrequests for 343 reproducible map bases from government and private industry.

Special Project Mapping

Special Project Mapping was continued on a modest scale. Work included jobs requested by the Inventory and Engineering Branch in connection with their floodplain mapping and water storage investigations, and as addition to the Hope-Merritt Project for the Ministry of Transportation and Highways.

Reprographics

The continuing increase in the cost of all reprographic materials caused some limitations in service volume but this was offset when other ministries were able to fund their product needs.

The registry of Ministry of Environment forms was transferred from Computer Services to the Reprographics Group and this should result in improved service. A total of 25,855 requisitions were processed through the Air Photo and Reproduction Laboratories. The gross value of work completed, as shown in Table 5, was $812,943.

MAPS-B.C. (Map and Air Photo Sales)

The MAPS-B.C. office, an arm of the Surveys and Mapping Administrative Group, is responsible for distributing maps and air photos requested by the general public, government ministries, and Crown Corporations. The public sales counter at 553 Superior Street served 7,267 customers and generated $91,939 in cash income. There were 9,673 requisitions for maps and photos and the number of mapsheets distributed reached 176,509 with a gross value of $493,537. The MAPS-B.C. office also distributed 7,232 Itek process photo prints valued ata $14,464. Additional statistics may be found in Table 10.

Toponymy

The Toponymy Unit processed 800 geographical names on 438 Canadian Permanent Committee on Geographical Names decision lists. Decision list BCS1-214 contains the name Mount Terry Fox near Valesmount which permanently recognises the Marathon of Hope runner from Port Coquitlam.

SURVEY SECTION

The Survey Section supplies air photography and field control for the Mapping Program. Air photography is also acquired for other Ministries for resource inventory and monitoring purposes. The Survey Section continues to supply specialised support maintenance and fabrication services to the Branch through the Electronics and Instrument Shop. The Computing Group is responsible for the adjustment and computational functions of the field survey data obtained by the Field Survey Group as well as performing the final adjustment and acceptance evaluation for all control surveys produced under contract.

Air Survey Group

The Air Surveys Group's operations (Table 8) were divided among twelve requesting agencies this year. The Ministry of Forests was again the largest user of the service with the Ministry of Lands, Parks and Housing the next largest. B.C. Hydro requested several projects to be flown as part of their winter thermal scan program. Unfortunately, climatic conditions were seldom suitable for the exact require-

ments of their study and production for them in the winter of 1981 was minimal.

The early season was relatively unproductive, but from mid-July normal photo accomplishment was being obtained. Unfortunately aircraft problems in August caused the loss of an exceptional period of good weather during which the whole province was open for aerial photography.

A long Indian summer rescued the annual program, particularly with respect to the southern latitudes of the province.

Two hundred and seventeen separate projects were attempted for a total of 36,887 photos at various scales. See Table 7.

Field Survey Group

Four survey crews were in the field during the prime survey season. Three field crews were engaged in mapping control surveys for the Base Mapping Program and one crew was engaged in integrated control surveys. See Table 6. Mapping control was established in three areas this year for the Base Mapping Program covering 314 full mapsheets and 68 partial mapsheets for mapping at a scale of 1:5,000. Seven hundred and five integrated control points were controlled horizontally and vertically, and 262 site locations were established for future monumentation. The three mapping areas were the Lower Fraser Valley north of the Fraser River, East coast of Vancouver Island and Nanaimo north to the Parksville-Countenay area including the Alberni Valley, and Hazelton-Kispiox. Integrated surveys were conducted in Saanich, Kamloops, Rossland, Nanaimo, and Vancouver.

Computations and Records Group

The Computations Group produced final adjusted coordinates for all the control surveys performed by the Field Survey Group as well as performing the final adjustments and acceptance evaluation for all control surveys produced under contract. A total of 57 computations and adjustment projects were completed. The analysis of the provincial control system continues in preparation for the transformation from the 1927 Datum to the 1983 Geocentric Datum. To date, approximately 50% of the provincial control has been evaluated.

Instrument Shop and Electronic Maintenance

Two hundred and sixty-three fabrication and maintenance projects were completed for the Branch this year. The majority of the staff's time was devoted maintaining the Branch's equipment.

PROGRAMS AND PLANNING SECTION

The Programs and Planning Section is responsible for administering contracts for base maps produced for the province by private industry. Besides managing contract mapping from the invitation to bid stage through to final checking prior to approval, the Section also maintains central records of all base mapping produced by either public or private agencies and disseminates information on progress of the Base Mapping Program.

A total of 25 contracts were issued in addition to the extension of 3 contracts from fiscal 1980/81. Half of the contracts, worth $330,000, covered large scale base mapping cost-sharing projects with regional districts or municipalities. The other half whose net value was $1,070,000 covered professional services delivered by the province's private sector.

Two of the contract projects involved integrated survey work in the City of Vancouver and in Tumbler Ridge. A third contact was let for maintenance and conversion of the Inter-Provincial Boundary between Alberta and British Columbia in the vicinity of Deadman Pass. The remaining projects were all concerned with base mapping. The details of the 1981/82 accomplishment in the Contract Program are listed in Table 9, Contract Mapping 1981/82.

The 1982/83 Base Mapping Program was planned as in previous years by canvassing 6 provincial ministries, 2 crown corporations, 28 regional districts, and 141 municipalities. Invitations to send applications for cost-sharing were sent out through the Ministry of Municipal Affairs in July and the program was constructed between September and December, 1981. Over 100 copies of the 1981/83 Base Mapping Program Book were delivered and are available to interested parties.

The structure of the Base Mapping

Data Bank is slowly taking shape. Design and implementation of parts of the Data Bank will be initiated in 1982-83 with the assistance of the Ministry's Computing Branch. The Data Bank will ultimately provide a reference service supporting both in-house and outside activity in surveying and mapping; a service which will hopefully reduce costly duplication of effort and lead to better planning.

Statistics

Appendix I
Ministry of Environment Expenditures

MINISTRY OF ENVIRONMENT

SUMMARY OF CASH REVENUE AND RECOVERIES

For the Year Ended March 31, 1982

REVENUE:		
Water Management:		
Power		$ 94,900,215
Domestic, incidental use and fees		1,177,588
Waterworks		337,578
Irrigation		24,298
Funds received on applications		163,092
		$ 96,602,771
WILDLIFE ACT fees and licences		6,413,444
Sale of maps and air photos		574,316
Project S.A.M.		127,093
Pesticide licences and exam fees		66,670
Marine Resources-licences and permits		52,852
Sale of improvements to property - EMERGENCY PROGRAM ACT		92,108
Publications		44,714
Environmental Laboratory fees		44,928
Miscellaneous		81,374
		$ 104,100,270
RECOVERIES:		
Federal Government:		
CANADA-BRITISH COLUMBIA JOINT DEVELOPMENT ACT		2,578,086
Fraser River Estuary Study		54,693
Salmonid Enhancement Program		487,399
Provincial Emergency Program		211,385
Marine Resources		77,189
		$ 3,408,752
B. C. Hydro:		
Canada-British Columbia Hydrometric	$ 162,974	
Revelstoke Water Licence	74,660	
Fish and Wildlife recoverables	532,415	770,049
		4,178,801
Total Revenue and Recoveries		$ 108,279,071

MINISTRY OF ENVIRONMENT

Summary of Expenditure by Appropriation
For the Fiscal Year Ended March 31, 1982

Vote No.	Description	Appropriations	Actual Expenditures *
		$	$
76	Minister's office	223,935	191,131
77	General administration	5,516,921	5,470,160
78	Resource and environment management	50,679,915	50,468,605
79	Environmental Laboratory program	2,864,580	2,688,552
80	Surveys and Mapping program	6,589,952	6,113,743
81	Provincial Emergency Program	1,702,820	1,543,108
82	Provincial Disaster		
	- Main estimates voted	6,000,000	6,000,000
	- Statutory-Flood Relief Act	828,865	828,865
83	Fish and Wildlife Conservation Fund	10	---
84	Building occupancy charges	7,792,000	7,681,285
85	Computer and consulting charges	2,271,800	2,234,583
	Statutory - Emergency Program Act	10,221,235	10,221,235
		94,692,033	93,441,267

* Expenditures are recorded on a modified accrual basis of accounting so that major expenditures are accrued where the goods have been received or delivered and the services rendered prior to year-end.

DETAIL OF EXPENDITURES BY APPROPRIATIONS (VOTES) AND ACTIVITIES, AND BY STANDARD EXPENDITURE CLASSIFICATIONS

MINISTER'S OFFICE

VOTE 76

Appropriations		Actual Expenditures
$218,076		
5,859	Legislative Assembly Allowances & Pension Act, Part 1, Section 12.	
$223,935	Total of Vote	$191,131

Expenditure by standard classification

Salaries - established	$130,870
Salaries - temporary	1,640
Travel expense	41,950
Office expense	11,147
Office furniture and equipment	1,152
Materials and supplies	379
Rentals-outside suppliers	2,160
Acquisition-machinery & equipment	1,722
Interest on overdue accounts	111
	$191,131

GENERAL ADMINISTRATION

VOTE 77

Appropriations		Actual Expenditures
	Expenditure by Activity	
$1,049,041	Executive Office	$1,066,168
4,025,880	General Administration	3,970,203
442,000	Grants	433,789
$5,516,921	Total of Vote	$5,470,160

Expenditure by standard classification

Salaries		$2,952,299
Temporary assistance		541,488
Fees and allowances-boards, commissions, courts		65,799
Travel expense		633,130
Professional and special services		254,608
Office expense		293,997
Office furniture and equipment		94,894
Advertising and publications		202,898
Materials and supplies		95,635
Motor vehicles		11,487
Rentals-outside suppliers		5,295
Acquisition-land and buildings		
Acquisition-machinery and equipment		3,710
Grants, contributions, and subsidies		433,789
Other expenditures		250
Interest on overdue accounts		1,740
		$5,591,019
Less Transfers		
Vote 96 - Salary Adjustments	$ 96,260	
Vote 179 - Employee Benefits	1,254	
Vote 177 - Pre-retirement Leave	23,345	
		$ 120,859
		$5,470,160

RESOURCE AND ENVIRONMENT MANAGEMENT

VOTE 78

Appropriations		Actual Expenditures
	Expenditure by Activity	
$ 995,982	Air Management Program	$ 921,194
935,782	Coastal and Estuary Management Program	797,579
7,991,913	Fisheries Management Program(net of recoveries)	8,186,103
2,172,040	Marine Resources Program	2,074,992
504,838	Pesticide Control Program	480,260
5,049,262	Terrestrial Environment Management Program	5,102,596
6,426,960	Waste Management Program	5,666,661
20,382,360	Water Management Program (net of recoveries)	21,120,726
6,221,778	Wildlife Management Program(net of recoveries)	6,118,494
$50,679,915	Total of Vote	$50,468,605
	Expenditure by standard classification	
	Salaries - established	$25,787,149
	Salaries - temporary	5,564,588
	Travel expense	3,272,623
	Professional and special services	3,787,670
	Office expense	734,075
	Office furniture and equipment	340,721
	Advertising and publication	564,318
	Materials and supplies	1,566,293
	Motor vehicles	646,985
	Rentals-outside suppliers	841,121
	Acquisition-land and buildings	8,153,132
	Acquisition-machinery and equipment	757,639
	Grants, contributions, and subsidies	824,642
	Interest on overdue accounts	11,489
	Recoveries from the British Columbia Hydro and Power Authority (Credit)	(841,195)
		$52,011,250
	Less Transfers	
	Vote 96 - Salary Adjustments $1,279,532	
	Vote 179 - Employee Benefits 91,653	
	Vote 177 - Pre-retirement Leave 171,460	
		$ 1,542,645
		$50,468,605

ENVIRONMENTAL LABORATORY PROGRAM

VOTE 79

Appropriations		Actual Expenditures
$2,864,580		$2,688,552
	Expenditure by standard classification	
	Salaries - established	$1,656,918
	Salaries - temporary	251,674
	Travel expense	37,120
	Professional and special services	845
	Office expense	57,519
	Office furniture and equipment	
	Materials and supplies	472,440
	Acquisition-machinery and equipment	223,852
	Interest on overdue accounts	917
		$2,701,285
	Less Transfers	
	Vote 96 - Salary Adjustments $12,707	
	Vote 179 - Employee Benefits 26	
		$ 12,733
		$2,688,552

SURVEYS AND MAPPING PROGRAM

VOTE 80

Appropriations	Expenditure by standard classification		Actual Expenditures
$6,589,952			$6,113,743
	Salaries - established		$3,419,000
	Salaries - temporary		238,132
	Travel expense		235,096
	Professional and special services		1,386,601
	Office expense		21,020
	Office furniture and equipment		7,813
	Advertising and publication		94,036
	Materials and supplies		676,669
	Motor vehicles		17,107
	Rentals-outside suppliers		17,982
	Acquisition-machinery and equipment		60,143
	Interest on overdue accounts		1,782
			$6,176,171
	Less Transfers		
	Vote 96 - Salary Adjustments	$45,387	
	Vote 179 - Employee Benefits	7,178	
	Vote 177 - Pre-retirement Leave	9,863	
			$ 62,428
			$6,113,743

PROVINCIAL EMERGENCY PROGRAM

VOTE 81

Appropriations		Actual Expenditures
$1,702,820		$1,543,108
	Expenditure by standard classification	
	Salaries - established	$ 878,692
	Travel expense	25,052
	Professional and special services	377,216
	Office expense	27,486
	Office furniture and equipment	1,487
	Materials and supplies	233,935
	Rentals-outside suppliers	16,397
	Acquisition-machinery and equipment	(13,692)
	Interest on overdue accounts	159
		$1,546,732
	Less Transfers	
	Vote 96 - Salary Adjustments $3,594	
	Vote 179 - Employee Benefits 30	
		$ 3,624
		$1,543,108

PROVINCIAL DISASTER

VOTE 82

Appropriations		Actual Expenditure
$6,000,000	Total of vote	
828,865	STATUTORY: Flood Relief Act	
	Administration	$ 326,169
	Southwest/80	4,098,275
	Southwest B.C./81	1,517,066
	South West Region/80	271,674
	Terrace Flood	89,053
	Bella Coola Flood	526,628
$6,828,865		$6,828,865

Expenditure by standard classification

Salaries - established	$ 193,500
Salaries - temporary	76,844
Travel expense	34,151
Professional and special services	1,008,358
Office expense	510
Advertising and publications	50
Materials and supplies	496,347
Rentals - outside suppliers	2,210,108
Acquisition - machinery & equipment	716,078
Acquisition - land & buildings	32,840
Grants, contributions and subsidies	2,059,798
Interest on overdue accounts	281
	$6,828,865

FISH AND WILDLIFE CONSERVATION FUND

VOTE 83

Appropriations		Actual Expenditures
$10		$ -
	Expenditure by standard classification	
	Salaries - temporary	$197,190
	Travel expense	35,159
	Professional and special services	89,158
	Office expense	3,870
	Materials and supplies	160,997
	Rentals-outside suppliers	182,463
	Acquisition-machinery and equipment	42,709
	Recoveries	
	Interest on overdue accounts	256
		$711,802
	Less recovery from the Habitat Conservation Fund	711,802
		$ -

BUILDING OCCUPANCY CHARGES

VOTE 84

Appropriations	Actual Expenditures
$7,792,000	$7,681,285
Expenditure by standard classification	
Rentals-outside suppliers	$7,681,285

COMPUTER AND CONSULTING CHARGES

VOTE 85

Appropriations		Actual Expenditures
$ 2,271,800		$ 2,234,583
	Expenditure by standard classification	
	Data systems and processing	$ 2,234,583
	STATUTORY	
	Emergency Program Act (R.S.B.C. 1979, chap. 106 sec. 16)	
10,221,235	Purchase of property subject to hazard	10,221,235
	Expenditure by standard classification	
	Professional and special services	382,538
	Acquisition-land and buildings	9,796,679
	Grants	42,018
		$10,221,235

Appendix II
General Administration

APPENDIX A

VOUCHERS PROCESSED IN REGIONS

(Includes Cheque Vouchers, Travel Vouchers, and Journal Vouchers)

REGION	1980-81*	1981-82
1	0	3481
2	0	2100
3**	0	1916
4	0	2802
6	0	1550
7	0	3465
8	0	2133

* Function during fiscal 1980-81 performed in Financial Services Branch

** Region 3 reports for Thompson-Nicola and Cariboo (Region 5)

APPENDIX B

WATER LICENCES

Approvals Processed

REGION	1980-81*	1981-82
1	0	0**
2	0	0
3	0	47 (Sept. 81-Mar. 82)
4	0	39 (Sept. 81-Mar. 82)
6	0	99
7	0	101 (Sept. - Mar.)
8	0	71

Licence Applications Processed

REGION	1980-81*	1981-82
1	0	0
2	0	0
3	0	0 (Not accepted until April 82)
4	0	0 (" " ")
6	0	125
7	0	77 (Sept.-Mar.)
8	0	289

APPENDIX C

WASTE PERMITS:
PROCESSED

REGION	1980-81*	1981-82
1	0	0
2	0	0
3	0	0
4	0	0
6	0	4
7	0	44
8	0	22

* During fiscal 1980-181 this function was performed by Waste - H.Q.

AMENDMENTS PROCESSED

REGION	1980-81*	1981-82
1	0	0
2	0	0
3	0	0
4	0	0
6	0	3
7	0	107
8	0	12

* During fiscal 1980-181 this function was performed by Waste - H.Q.

APPENDIX D

PESTICIDE CERTIFICATES

APPLICATOR CERTIFICATES

REGION	1980-81	1981-82
1	0	0 (by Pesticide Prog.)
2	0	2141
3	0	Serviced by Okanagan R.
4	0	Serviced by Okanagan R.
6	0	0 (Done by Pesticide P.)
7	0	58
8	0	323 (Serves Okanagan, Thompson Nicola-Cariboo and Kootenay Regions)

DISPENSOR CERTIFICATES

1	0	0 (by Pesticide Prog.)
2	0	2141
3	0	Serv. by Okanagan Reg.
4	0	Serv. by Okanagan Reg.
6	0	0 (by Pesticide Prog.)
7	0	58
8	0	237 (Serves Regions 3, 5 and 4)

Appendix D continued

VENDOR LICENCES ISSUED

REGION	1980-81	1981-82
1	0	0 (by Pesticide Prog.)
2	0	472
3	0	Serv.by Okanagan Reg.
4	0	Serv.by Okanagan Reg.
6	0	0 (by Pesticide Prog.)
7	0	110
8	0	218 (Serves Regions 3, 4 and 5)

SERVICE LICENCES ISSUED

1	0	0 (by Pesticide Prog.)
2	0	274
3	0	Serv.by Okanagan Reg.
4	0	Serv.by Okanagan Reg.
6	0	0 (by Pesticide Prog.)
7	0	81
8	0	111 (Serves Regions 3, 4 and 5)

Appendix III
Marine Resources Program

Marine Resources Branch

Table 1

Number of Licences and Permits and Associated Revenue for Fiscal Years 1975 to 1980.*

	1975		1976		1977		1978		1979		1980		1981	
	Number	Revenue	Number	Revenue	Number	Revenue	Number	Revenue	Number	Revenue	Number	Revenue	No.	Revenue
Salmon cannery	18	$7,200	21	$8,400	21	$8,400	19	$7,600	22	$8,800	18	$7,200	19	$ 7,600
Salmon brine-curing	—	—	—	—	—	—	1	25	3	75	8	200	11	275
Salmon dry-saltery	—	—	1	25	1	25	15	375	18	450	19	475	17	425
Tierced salmon	3	300	3	300	3	300	3	300	2	200	1	100	-	-
Herring cannery	1	25	—	—	—	—	2	50	2	50	2	50	3	75
Herring dry-saltery	—	—	1	25	1	25	5	125	7	175	14	350	13	325
Pickled herring	3	75	3	75	4	100	7	175	9	225	13	325	10	250
Herring reduction	7	2,800	6	2,400	8	3,200	9	3,600	8	3,200	4	1,600	4	1,600
Sport-caught fish cannery	4	100	1	100	5	125	5	125	4	100	4	100	4	100
Shellfish cannery	5	500	3	300	5	500	7	700	8	800	8	800	9	900
Tuna cannery	1	100	1	100	1	100	2	200	2	200	2	200	2	200
Dogfish reduction	2	100	2	100	—	—	—	—	—	—	—	—	-	-
Fish-offal reduction	7	350	7	350	8	400	8	400	9	450	7	350	8	400
Fish cold storage	51	6,525	58	7,575	58	7,575	70	8,800	80	9,875	92	8,425	91	8,575
Fish processing	122	8,780	141	10,490	140	10,485	173	12,885	177	14,700	179	13,815	173	15,780
Subtotals	224	26,855	251	30,240	255	81,235	326	35,360	351	39,300	371	33,990	346	36,505
Fish-buyers' licences	365	18,250	345	17,250	465	23,250	660	33,100	651	32,600	672	33,600	595	29,750
Oyster picking permits	117	1,170	128	1,280	89	890	86	860	65	650	62	620	73	730
Aquatic plant harvesting permits	1	50	10	500	3	150	2	100	20	1,000	30	1,500	27	1,350
Aquatic plant processing permits	2	400	1	200	—	—	—	—	1	200	1	200	-	-
Totals	709	$46,725	735	$49,470	812	$55,525	1,074	$69,420	1,088	$3,750	1,136	$69,910		$68,335

* Fiscal year covers the period April 1 to March 31

Table 2 - Number of Sport-Caught Fish Canned - by species.

Species	1980	1981
Chinook	8,769	7,543
Coho	16,914	8,793
Pink	517	4,476
Chum	191	247
Sockeye	1.131	1.625
Steelhead	19	--

Table 3 - B.C. Canned Salmon Production Comparison - (48 lb. cases) *

Species	1980	1981
Sockeye	388,206	622,335
Chinook	6,768	7,834
Coho	82,651	61,329
Pink	456,363	1,020,276
Chum	170,346	87,862
Steelhead	440	471
Total	1,104,774	1,800,107

Table 4 - Number of Registered Oyster Lease Holders and Leased Acreage for the Years 1974/75 to Year Ending March 31, 1982.

Year	No. of Lease Holders	Acres
1974-75	65	1902.0
1975-76	68	1790.2
1976-77	65	1722.9
1977-78	66	1712.8
1978-79	78	1900.5
1979-80	90	2273.9
1980-81	100	2685.0
1981-82	117	2800.2

* Table 3 is a summary of production since 1975. The 1981 figures are an estimate as all returns have not yet been received.

Table 5 - Annual Oyster Production in British Columbia (in U.S. gallons) for the Years 1975/76 to the Year ending December 31, 1981.

YEAR	SHUCKED MEAT U.S. GALLONS	LANDED VALUE
1975	89,255	883,000
1976	89,249	887,000
1977	82,448	981,000
1978	76,815	1,021,000
1979	61.373	893.000
1980	52.862	1,134,000
1981	67,784	1,301,392*

* Estimated as all returns not received at time of writing.

Table 6 - Habitat Protection Referrals Actioned from April 1, 1981 to March 31, 1982.

Ministry of Lands, Parks and Housing	42
Ministry of Transportation and Highways	10
Waste Management Branch	32
	84

Appendix IV
Pesticide Control Program

TABLE 1

STATISTICAL SUMMARY OF ACTIVITIES - April 1, 1981 to March 31, 1982

	REGIONS						
	H.Q.	1	2	5,6,7	3,4,8	81/82 Total	(80/81 Total)
1. IMMEDIATE ADVERSE EFFECTS							
Pesticide Misuse Incidents		0	67	7	28	102	--
Poisonings		0	13	0	44	57	--
2. SHORT-TERM REMEDIES							
Pesticide Misues Investigations & Complaints		15	67	7	82	171	56
Suspensions Recommended		10	2	0	29	41	30
Revocations Recommended		1	0	0	1	2	--
Charges Laid		0	2	0	15	17	4
Inspections		350	926	145	688	2109	2735
Contraventions Found During Inspections		175	0	0	160	335	--
Pesticides Collected for Disposal		20	35	1	17	73	95
3. LONG-TERM REMEDIES							
Pesticide Applicator Courses Presented		7	22	10	10	49	
Candidates Attending Courses		258	649	198	309	1414	107
Pesticide Dispenser Courses Presented		7	13	5	11	36	
Candidates Attending Courses		128	321	118	181	748	--
Pesticide Applicator Certificates Issued		246	1915	477	323	2961	2994
Pesticide Dispenser Certificates Issued		205	2167	265	237	2874	
Vendor Licences Issued		192	472	110	218	992	1027
Pest Control Service Licences Issued		116	274	58	111	559	482

...2

TABLE 1
continued

STATISTICAL SUMMARY OF ACTIVITIES - April 1, 1981 to March 31, 1982

	REGIONS						
	H.Q.	1	2	5,6,7	3,4,8	81/82 Total	(80/81 Total)
3. LONG-TERM REMEDIES (continued)							
Use Permits Issued	373					373	350
Special Use Permits (Research)	56					56	35
Restricted Permits	73					73	60
Pre-Permit Site Inspections Made		50	2		86	138	52
Appeals Against Permits	40			1	5	40	48
Ministerial Letters	86	4	0	0	3	93	109

Appendix V
Fisheries Management/ Wildlife Management Programs

Table 6.1
Harvested Animals Checked

Year	Days of Stations Operation	Number of Checked Hunters	Moose	Deer	Other Big game	Grouse	Ducks	Geese
1981	56	12,670	2,781	959	257	6,613	2,163	243
1980	60	13,731	2,893	1,138	336	8,890	2,025	210
1979	62	15,230	3,114	1,165	317	21,173	2,156	207
1978	58	12,625	2,922	603	432	22,701	2,798	262
1977	73	13,243	3,287	662	419	16,429	2,491	205
1976	72	11,888	3,305	393	364	9,992	1,733	159
1975	75	13,848	4,546	405	486	11,769	2,623	228

Table 6.2
Estimates of Resident Hunter Harvest

Year	Hunting Licence Sales	Deer	Moose	Elk	Goat	Sheep
1975	143,652	28,977	13,383	1,041	623	193
1976	139,510	22,018	10,898	760	498	162
1977	144,447	23,771	12,826	1,278	579	251
1978	155,605	28,550	12,688	1,273	461	235
1979	163,088	29,965	13,045	1,471	366	188
1980	167,879	36,079	12,486	1,354	427	210

Year	Grizzly Bear	Black Bear	Caribou	Cougar	Grouse	Ducks
1975	149	2,443	501	196	**	**
1976	158	3,203	405	148	385,000	244,000
1977	165	3,453	386	116	278,203	149,540
1978	124	3,076	143	174	485,781	181,205
1979	148	2,731	148	129	478,579	160,307
1980	205	5,670	141	92	306,057	145,549

** Data not available.

TABLE 6.3

COMPULSORY INSPECTION RESULTS FROM HARVEST REPORTS BY RESIDENT AND NON-RESIDENT HUNTERS

Species	Hunting Season 1977-78	1978-79	1979-80	1980-81	1981-82
Caribou	*	334	348	340	316
Cougar	142	212	150	106	212
Grizzly Bear	282	314	337	390	404
Mtn Goat	789	861	799	794	744
Rocky Mtn. Bighorn Sheep	32	44	37	41	65
California Bighorn Sheep	51	55	49	49	73
Dall Sheep	14	15	10	14	6
Stone Sheep	422	369	370	335	409
TOTAL	1,732	2,204	2,100	2,069	2229

TABLE 6.4

GENERAL RESULTS OF THE LIMITED ENTRY HUNTING SEASON

Species	Applications for Licence	Licences Issued
Caribou	412	73
Elk	10119	1924
Grizzly Bear	347	35
Moose	8906	6410
Goat	3736	514
Sheep	1477	99
Deer	4887	3036

TABLE 6.5
SUMMARY OF GUIDED HUNTER ACTIVITY IN THE 1981/82 HUNTING SEASON

Region	Number of Active Guide Outfitters	Number of Active Assistant Guides	Number of Guided Resident Hunters	Number of Guided Non-resident Canadian Hunters	Number of Guided Non-resident Alien Hunters	Moose	Goat	Caribou	Deer	Sheep	Grizzly Bear	Black Bear	Elk	Cougar	Coyote	Wolf
1	5	8	128	5	83	-	-	-	180	-	4	103	-	4	-	-
2	2	3	-	-	10	-	1	-	1	-	-	8	-	-	-	-
3	12	18	3	2	116	17	1	-	11	4	-	23	-	5	-	-
4	35	126	8	28	559	7	29	-	98	14	7	98	127	5	-	-
5	68	101	37	3	726	327	11	5	37	4	9	23	-	-	-	-
6	58	178	24	39	825	307	161	95	48	68	61	111	-	-	-	18
7	83	265	18	34	1260	743	122	82	1	156	78	122	118	-	-	14
8	12	24	17	5	127	1	2	-	23	1	1	77	-	16	1	-
TOTALS	275	723	235	116	3706	1402	327	182	399	247	160	565	245	30	1	32

Table 6.6a COMPOSITION OF THE 1980/81 B.C. WILD FUR HARVEST

Fur Type	No. of Pelts	% of Total Fur Harvest	($) Average Value	($) Total Value
Beaver	18,166	10.3	31.27	568,051
Muskrat	30,798	17.4	6.20	190,948
Mink	5,961	3.4	37.12	221,272
Otter	747	0.4	54.49	40,704
Coyote	2,949	1.7	58.07	171,248
Fox	590	0.3	45.83	27,040
Wolf	228	0.1	80.65	13,388
Weasel	6,171	3.5	1.27	7,837
Wolverine	225	0.1	202.78	45,625
Skunk	23	tr.	4.43	102
Fisher	551	0.3	136.41	75,162
Marten	30,163	17.0	32.08	967,629
Lynx	3,696	2.1	297.16	1,098,303
Bobcat	130	0.1	210.84	27,409
Squirrel	76,209	43.0	1.57	119,648
Raccoon	615	0.3	41.20	25,338
SUBTOTALS	177,222	100.0	-	3,599,704
Black Bear	358	16.9	47.05	16,844
Grizzly Bear	17	0.8	475.00	8,075
Cougar	19	0.9	193.75	3,681
Castoreum and Miscellaneous	1,725	81.4	-	20,644
SUBTOTALS	2,119	100.0	-	49,244
TOTALS	179,341	-	-	3,648,948

Table 6.6b BRITISH COLUMBIA WILD FUR HARVESTS, 1975-81

Number of Pelts by Fur Harvest Year

Species	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81
Beaver	13,693	17,001	16,662	20,413	24,309	18,166
Muskrat	21,050	48,093	52,142	40,426	35,540	30,798
Mink	2,494	4,755	3,455	5,266	7,686	5,961
Otter	702	1,021	861	834	939	747
Coyote	2,905	4,689	4,656	5,290	4,691	2,949
Fox	621	557	654	571	634	590
Wolf	190	151	443	406	268	228
Weasel	7,308	7,333	5,322	5,723	9,139	6,171
Wolverine	455	424	383	275	283	225
Skunk	—	161	15	24	38	23
Fisher	1,043	784	657	472	570	551
Marten	7,974	23,551	23,719	21,312	32,732	30,163
Lynx	3,084	1,294	1,119	1,577	2,848	3,693
Bobcat	221	205	289	240	140	130
Squirrel	27,190	81,194	44,451	73,830	183,110	76,209
Raccoon	748	653	1,002	1,486	1,179	615
Black Bear	219	—	328	566	480	358
TOTAL VALUE in $(Millions)	1.8	2.1	2.1	3.6	4.1	3.6

Table 6.7 NUMBER OF ANNUAL GRADUATES FROM TRAPPER EDUCATION PROGRAM from inception

Year	Number of Students
1976/77	564
1977/78	756
1978/79	397
1979/80	398
1980/81	480
1981/82	449
Total	3,044

Table 6.8a 1980 ANGLER EFFORT DISTRIBUTION

REGION	ANGLER DAYS 1980			% INCREASE IN ANGLER EFFORT 1969/70-1980/81
	B.C. RESIDENT	NON-RESIDENT	TOTAL	
Vancouver Island (1)	466,500	41,400	507,900	17.9
Lower Mainland (2)	597,200	16,700	613,900	30.0
Thompson-Nicola (3)	741,400	139,900	881,300	17.6
Kootenay (4)	778,400	165,500	943,900	106.0
Chilcotin-Cariboo (5)	475,400	119,700	595,100	258.7
Skeena (6)	427,200	74,300	501,500	168.2
Omineca-Peace (7)	484,500	54,100	538,600	57.1
Okanagan (8)	580,800	50,800	631,600	57.9
PROVINCIAL TOTAL	4,551,400	662,400	5,213,800	61.5

Table 6.8b STEELHEAD FISHING: LICENCES, ANGLERS, CATCH, ANGLING DAYS
1975/76 to 1980/81

Year	Licensees	Number of anglers	No. of successful anglers	Total catch		Total days of angling
				Kept	Released	
1975-76	29,594	20,265	8,770	31,490	26,546	219,797
1976-77	25,539	18,356	6,998	20,168	20,450	186,381
1977-78	23,406	17,143	7,038	18,154	27,047	174,721
1978-79	24,600	15,788	6,746	14,725	24,748	159,363
1979-80	25,095	14,755	6,384	12,663	26,906	134,569
1980-81	22,301	12,894	6,388	10,941	39,983	131,886

Table 6.9 EGGS COLLECTED BY PROVINCIAL HATCHERIES 1981/82

SPECIES	KOOTENAY	SUMMERLAND	FRASER VALLEY	LOON CREEK	VANCOUVER ISLAND	PEACE CANYON
Rainbow (wild)	3,068,100	3,198,000		1,504,267		44,260
Rainbow (domestic)	534,150[1]		371,760			
Brood		1,191,000				
Cutthroat (yellowstone)	413,200					
Cutthroat (coastal)			184,480			
Brown			8,300		30,000	
Kokanee	5,627,910					
Dolly Varden	171,565					
Steelhead			487,835	125,138	324,000	
Cutthroat (anadromous)			135,717		124,753	
Chinook				148,316		
	9,814,925	4,389,000	1,188,092	1,777,721	478,753	44,260
						Wild 16,602,361
						or 94%

[1] Duncan brood stock.

Table 6.10 FISH LIBERATED FROM PROVINCIAL HATCHERIES IN 1981/82 (total kg in parentheses)

SPECIES	KOOTENAY	SUMMERLAND	FRASER VALLEY	LOON CREEK	VANCOUVER ISLAND
Rainbow (native)	509,364 (2,801)	1,968,701 (8,910)	112,250 (654)	2,310,750 (10,469)	
Rainbow (domestic)	5,698 (949)		234,442 (12,060)		
Brood	62,840 (268)	244,000 (1,748)		467,000 (1,334)	
Cutthroat (coastal)			64,920 (3,540)		
Cutthroat (yellowstone)	297,000 (39)				
Brown			8,700 (6)		9,600 (1)
Kokanee	290,575[1] (189)				
Dolly Varden	5,100 (18)				
Steelhead			313,324[3] (7,432)	39,058 (1,692)	9,585 (575)
Cutthroat (anadromous)			31,688[2] (2,389)		71,132 (2,846)
Chinook				55,613 (148)	
	1,170,577 (4,264) 126 lakes 8 streams	2,212,701 (10,658) 213 lakes 2 streams	765,324 (26,081) 128 lakes 13 streams	2,872,421 (13,643) 180 lakes 2 streams	90,317 (3,422) 8 streams

[1] In addition, 4,395,000 eyed eggs planted in 5 streams (Hill, Inonoaklin, Lamb, Trout, Canimred).
[2] All fish reared at Surrey Pond and Inches Creek.
[3] About 11,200 fish were reared at Surrey Pond.

Table 6.11 GROSS REVENUE BY MAJOR ACTIVITY

	1979/80	1980/81	1981/82
Hunting	$3,943,666 (59%)	$4,055,784 (59%)	$4,027,344 (58%)
Angling	2,451,631 (37%)	2,514, 001 (37%)	2,646,353 (38%)
Other*	246,565 (4%)	261,050 (4%)	290,223 (4%)
TOTALS	$6,641,862	$6,830,845	$6,963,920

* includes revenue from trapping, guiding, fur trading, fines, etc.

Table 6.12 GROSS REVENUE FROM RESIDENT AND NON-RESIDENT HUNTING AND ANGLING LICENCE SALES

	1979/80	1980/81	1981/82
Resident Hunting	$2,537,022 (61%)	$2,684,534 (62%)	$2,774,129 (61%)
Resident Angling	1,626,421 (39%)	1,656,221 (38%)	$1,775,986 (39%)
TOTAL	$4,161,443	$4,340,755	$4,550,115
Non-Resident Hunting	$1,344,080 (62%)	$1,306,708 (60%)	$1,246,294 (59%)
Non-Resident Angling	823,426 (38%)	856,002 (40%)	368,414 (41%)
TOTAL	$2,167,506	$2,162,710	$2,114,708
Special/Firearms and Duplicate Hunting,	$ 62,564 (97%)	$ 64,542 (97%)	$ 66,921 (97%)
Duplicate Angling	1,784 (3%)	1,788 (3%)	1,953 (3%)
TOTAL	$ 64,348	$ 66,330	$ 68,874
GRAND TOTAL	$6,393,297	$6,569,975	$6,733,697

Table 6.13 RESIDENT HUNTING LICENCE SALES

	1979/80		1980/81		1981/82	
	Number	Value	Number	Value	Number	Value
B.C. Resident	153,925	$1,077,475	158,033	$1,107,231	163,982	$1,147,874
Senior Citizen	9,163	9,163	9,844	9,844	10,106	10,106
Black Bear	18,169	72,676	21,818	87,272	22,289	89,155
Caribou	1,563	15,630	1,388	13,850	1,556	15,560
Cougar	524	5,240	478	4,780	624	6,240
Deer	127,582	510,328	132,974	431,896	138,171	552,684
Elk	11,645	116,450	13,925	139,250	15,825	158,250
Grizzly Bear	1,452	50,820	1,809	63,315	2,158	75,530
Moose	59,420	594,200	62,448	624,480	63,355	633,550
Mountain Goat	1,981	29,715	2,048	30,720	2,232	33,480
Mountain Sheep	1,621	40,525	1,703	42,575	2,068	51,700
*Limited Entry Hunting Lic.	1,342	6,710	2,983	-	12,476	-
Limited Entry Hunting App.	8,090	8,090	15,163	30,316	31,000	-
TOTAL LICENCES	396,477	$2,537,022	424,611	$2,684,534	465,842	2,774,129

*No fee for Limited Entry Hunting Licence or Application in 1981/82.

Table 6.14 NON-RESIDENT HUNTING LICENCE SALES

	1979/80		1980/81		1981/82	
	Number	Value	Number	Value	Number	Value
Non-Resident	4,350	326,250	4,122	309,150	3,835	287,625
Canadian Resident (Non-B.C.)	745	5,215	774	5,418	787	5,509
Non-Resident Game Bird	428	10,700	662	11,550	443	11,075
Black Bear	1,576	63,040	1,891	75,640	1,874	74,960
Caribou	624	62,400	498	49,800	462	46,200
Cougar	65	6,500	62	6,200	66	6,600
Deer	761	38,050	835	41,750	1,017	50,850
Elk	611	61,100	664	66,400	792	79,200
Grizzly Bear	728	218,400	778	233,400	713	213,900
Moose	3,245	324,500	2,924	292,400	2,618	261,800
Mountian Goat	821	82,100	682	68,200	640	64,000
Mountain Sheep	430	107,500	418	104,500	422	105,500
Wolf	511	38,325	564	42,300	521	39,075
TOTALS	14,895	1,344,080	14,874	1,306,708	14,190	1,246,294

Table 6.15 SPECIAL HUNTING AND FIREARMS LICENCE SALES

	1979-80		1980-81		1981-82	
	Number	Value	Number	Value	Number	Value
Firearms	18,938	$18,938	18,348	$18,348	17,909	$17,909
Bow Hunting	2,035	6,905	2,483	7,449	3,040	9,120
Fraser (Valley)	6,581	32,905	6,723	33,615	7,118	35,590
Creston (pheasant)	119	1,190	107	1,070	ø	ø
Duplicates	1,713	3,426	ø	ø	2,151	4,302
TOTAL	29,386	$62,564	29,691	$64,542	30,218	66,921

Table 6.16 RESIDENT ANGLING LICENCE SALES

	1979-80		1980-81		1981-82	
	Number	Value	Number	Value	Number	Value
B.C. Resident	306,087	$ 1,530,435	313,687	$ 1,568,435	336,735	$1,683,675
Senior Citizen	26,296	26,296	27,423	27,423	28,768	28,768
Steelhead	23,230	69,690	20,121	60,363	21,181	63,543
TOTALS	355,613	$ 1,626,421	361,231	$ 1,656,221	386,684	1,775,986

Table 6.17 NON-RESIDENT ANGLING LICENCE SALES

	1979-80		1980-81		1981-82	
	Number	Value	Number	Value	Number	Value
Canadian Resident (non B.C.)	51,258	$ 256,290	56,507	$ 282,535	57,247	$ 286,235
Non-Res. (Annual)	21,460	321,900	21,964	329,460	22,863	342,945
Non-Res. (Three-day)	30,053	180,318	30,692	184,152	29,668	178,024
Steelhead	22,118	21,173	2,180	21,800	2,214	22,140
Special Lakes	938	14,070	507	8,805	658	9,870
Special Rivers	1,187	29,675	1,170	29,250	1,168	29,200
TOTALS	107,014	$ 823,426	113,100	$ 856,002	113,818	$ 868,414

Table 6.18 OTHER REVENUE (SOURCES OTHER THAN HUNTING OR ANGLING)

	1979/80		1980/81		1981/82	
	Number	Value	Number	Value	Number	Value
Resident Trapping	3,246	$ 16,230	3,178	$ 15,890	3,195	$ 15,975
Guides	1,479	23,775	1,616	23,220	1,602	22,585
Fur Traders Licence	80	2,450	75	2,325	80	3,100
Royalty on Furs	-	66,299	-	81,902	-	96,536
Fines Imposed Under Wildlife Act and Firearms Act	-	121,884	-	121,000	-	130,000*
Duplicates	8	16	16	32	6	12
Miscellaneous	-	15,910	-	17,490	-	22,015
TOTALS	4,807	$246,564	4,885	$261,859	4,883	$290,223

*Estimated

Table 6.19 COMPARISON OF PREDATOR-RELATED LIVESTOCK LOSSES, 1979-1981

	Wolves			Coyotes			Bears[a]			Cougar			Total		
	'79	'80	'81	'79	'80	'81	'79	'80	'81	'79	'80	'81	'79	'80	'81
calves	98	101	78	44	39	18	48	26	32	6	7	5	196	173	133
grown cattle	53	32	45	7	8	5	13	4	14	-	-	1	73	44	65
lambs	3	15	3	72	82	111	3	4	3	-	3	6	78	104	123
sheep	21	5	5	49	57	43	9	21	18	3	14	24	82	97	90
	175	153	131	172	186	177	73	55	67	9	24	36	429	418	411

Table 6.20 PREDATORS REMOVED

	Wolves			Coyotes			Bears[a]			Cougar			Total		
	'79	'80	'81	'79	'80	'81	'79	'80	'81	'79	'80	'81	'79	'80	'81
Predators destroyed	56	138	162[b]	98	140	151[b]	613	721	452	42	38	32	809	1037	797
Translocated	-	-	-	-	-	-	89	83	66	4	-	2	93	83	68
Total Removed	56	138	162	98	140	151	702	804	518[c]	46	38	34[c]	902	1120	865

a - black and grizzly bear
b - wolves and coyotes shot, trapped and taking 1080 baits
c - bears and cougar removed in response to livestock, property and livestock complaints

Appendix VI
Water Management Program

WATER LICENCE APPLICATION BACKLOG

IN REGIONAL OFFICES

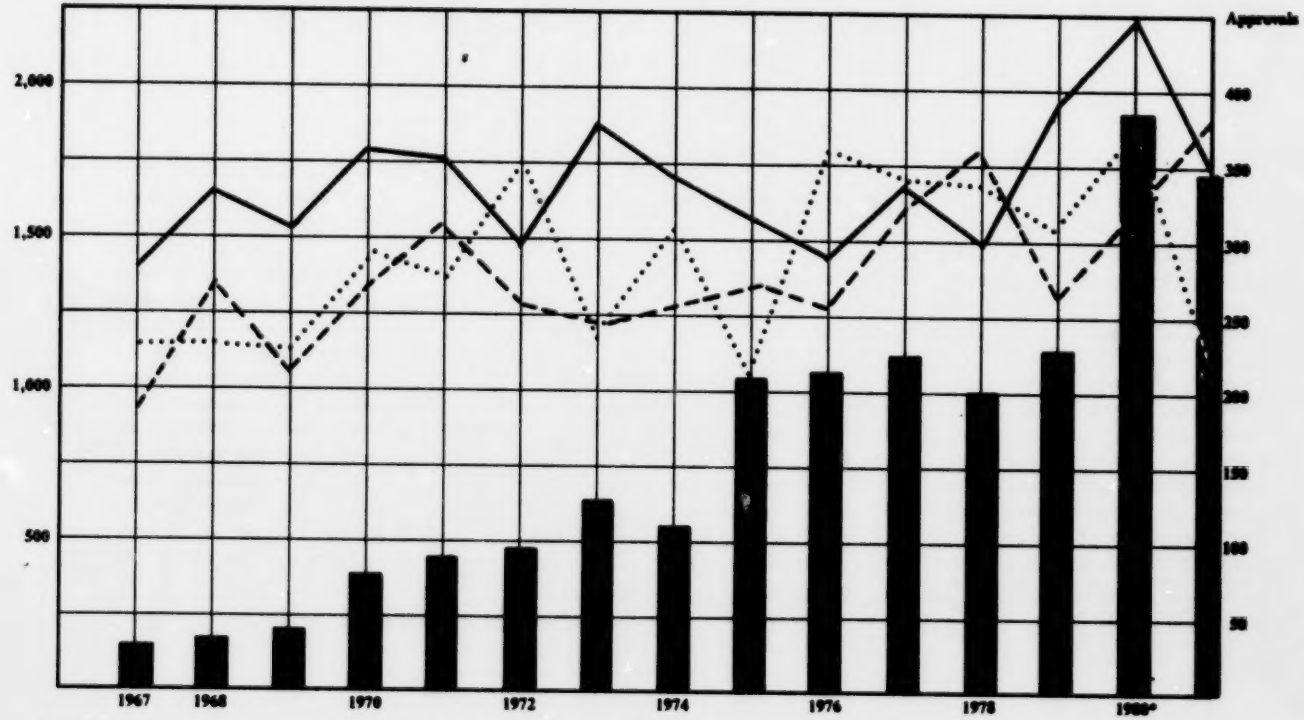
Region	Dec. 31/80	Target	Apr. 1/82
Vancouver Island	139	145	129
Lower Mainland	98	136	74
Thompson-Nicola	531	253	198
Kootenay	538	319	287
Cariboo	324	169	183
Skeena	55	76	72
Omineca Peace	94	48	96
Okanagan	396	248	266
Total	2175	1394	1305

Table 1 A SUMMARY OF WATER LICENCE ACTIVITIES 1971-1982

	Jan-Dec 71	Jan-Dec 72	Jan-Dec 73	Jan-Dec 74	Jan-Dec 75	Jan-Dec 76	Jan-Dec 77	Jan-Dec 78	Jan-Dec 79	Jan-Mar 80 81	Apr-Mar 81 82
Water Applications Received	1751	1479	1897	1712	1586	1451	1674	1461	1920	2245	1751
Application Backlog (Victoria)	1284	1163	1469	1233	1540	1225	1067	914	1092	1244	2162
Application Backlog (Regions)	1493	1362	1679	1951	2012	1801	1810	1489	1586	1888	1312
Total Application Backlog	2777	2525	3148	3184	3552	3026	2877	2403	2678	3132	3472
Reports Received on Applications	1583	1275	1172	1279	1347	1318	1660	1801	1277	1614	1834
Applications for Amendment of Licence				680	741	654	695	599	733	926	649
Reports Received on Amendments				237	389	475	576	450	545	820	572
Licence Amendments Completed	498	535	592	707	661	836	692	604	724	667	577
Licence Amendments Backlog						740	723	755	749	1007	1081
Approvals Granted by Comptroller	85	91	126	110	204	207	226	197	225	387	346
Approvals Granted by Water Managers											334
Licence Plats Prepared	2106	2463	2125	2017	2166	2427	2194	2278	1930	2419	1761
Conditional Licences Issued	1343	1747	1133	1542	1073	1770	1685	1679	1518	1871	1208
Final Licences Issued						479	440	368	254	169	89
Total Active Licences	24167	25913	27017	28598	29212	30143	31022	32134	33012	34100	34341
Victoria Administrative Staff	29	30	30	30	30	30	30	32	32	32	32

Table 2

Applications, Reports Received & Licences Issued



* 15 Months Ending March 31, 1981

LEGEND

Water Applications Received ——————

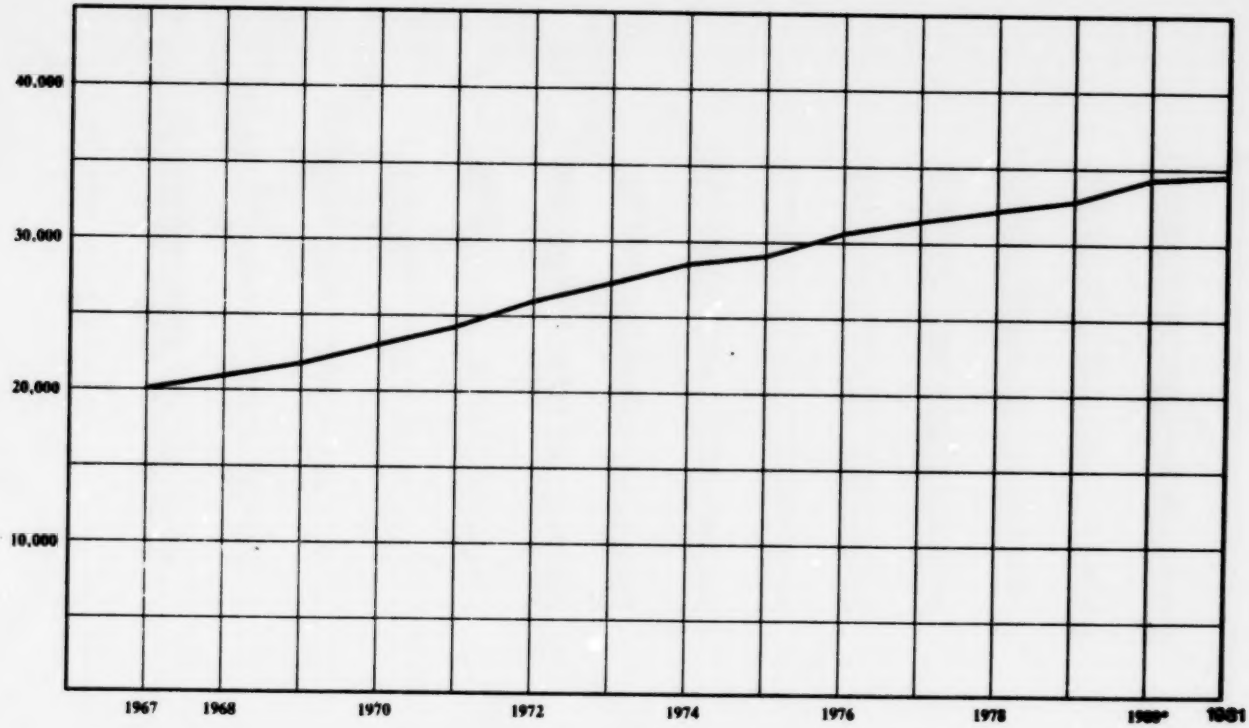
Conditional Licences Issued . . . . . .

Engineers Reports Received - - - - - - - - -

Approvals Granted ■

Table 3

Total Number of Licences



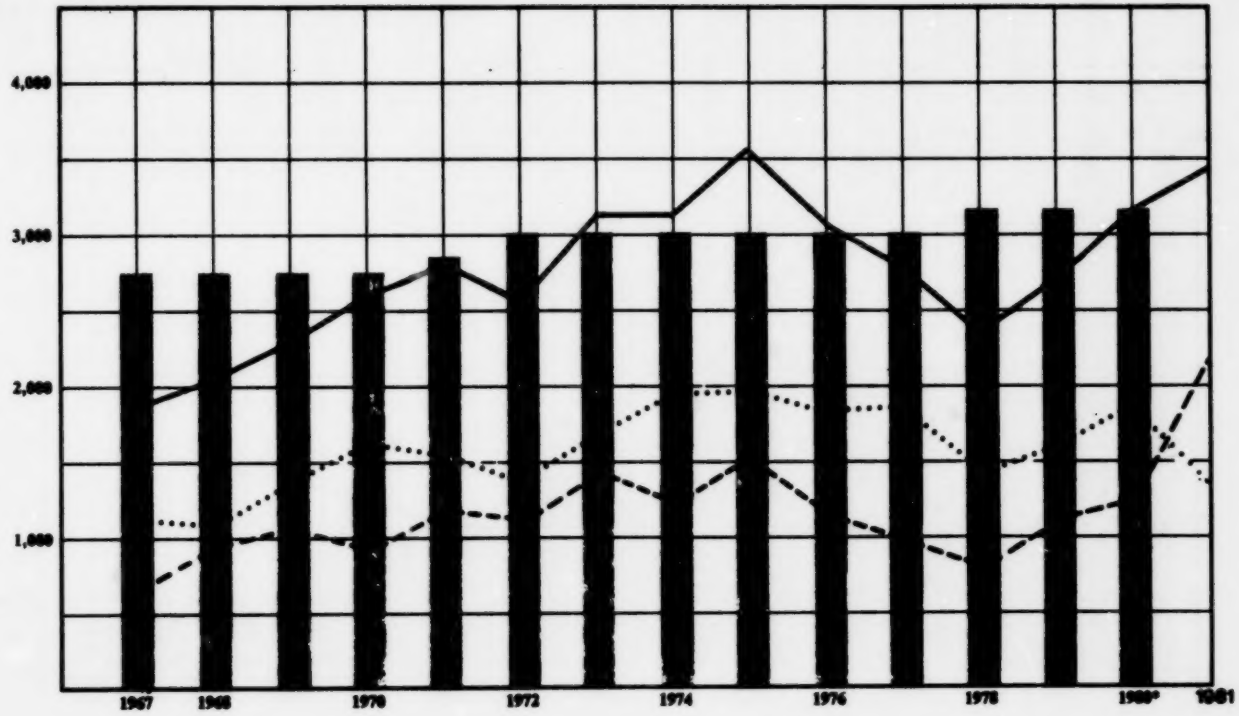
* 15 Months Ending March 31, 1981

LEGEND

Total No. of Licences ———————

Table 4

Water Licences Applications Outstanding



* 15 Months Ending March 31, 1981

LEGEND

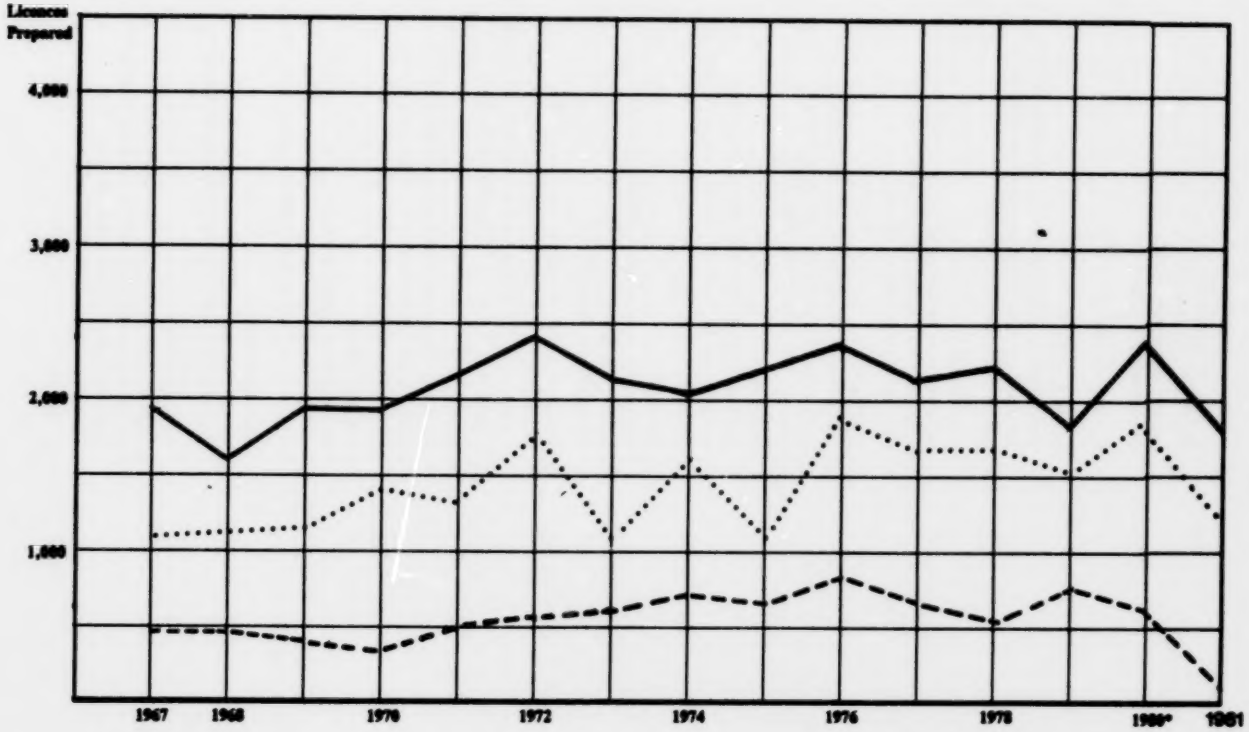
App'n. Backlog Total ————————

App'n. Backlog Regional Office . . . . . .

App'n. Backlog General Office — — — — —

Table 5

Licences Prepared and Issued and Staff



* 15 Months Ending March 31, 1981

LEGEND

Licence Plats Prepared ———— (3474)
Conditional Licences Issued ..... (1312)
Licence Amendments - - - - - - - - - - (2162)

TABLE 6

WATER RESOURCE QUALITY -
GROUNDWATER QUALITY

Area and Description

BUTTLE LAKE
Assessment completed of groundwater contamination from mining wastes for Waste Management Branch.

CRANBROOK
Assessment completed of potential groundwater pollution from oil for Waste Management Branch.

ELKFORD
Assessment completed of pollution vulnerability of wells for Public Health Engineering Section.

KAMLOOPS
Review completed of consultant's report on potential sites for effluent disposal for Waste Management Branch.

NELSON
Advisory assistance provided on proposed landfill site to Waste Management Branch.

PANORAMA SKI HILL
Assessment of groundwater conditions completed on proposed sewerage disposal scheme for Waste Management Branch.

PENTICTON
Review completed of consultant's report on proposed sewerage effluent disposal for Waste Management Branch.

SALMON RIVER
Assessment completed of groundwater conditions for proposed effluent discharge for Waste Management Branch.

SKOOKUMCHUCK
Advisory assistance on groundwater provided to Waste Management Branch.

SPALLUMCHEEN
Review completed of groundwater conditions relative to proposed sewerage effluent disposal scheme for Okanagan Regional Office.

Table 7 ENVIRONMENTAL ASSESSMENT REPORT REVIEW
SURFACE AND GROUNDWATER REFERRALS. QUANTITY/QUALITY

Coal Projects			
Northeast B.C.			
Bullmoose	Stage II		
Burnt River	Stage I		
Carbon Creek	Stage I		
Cinnabar Peak	Stage I		
Monkman	Stage II		
Quintette	Stage II		
Willow Creek	Stage I		
Southeast B.C.			
Byron Creek		Expansion	
B.C. Coal (J-Pat)		Expansion	Phase I
Fording Coal (Eagle Mountain)		Expansion	Phase I
Line Creek		Expansion	Phase I
Sage Creek		Stage II	
Vancouver Island			
Quinsam	Stage II		
Other			
Hat Creek	Stage II		
Metal Mines			
Adanac	Stage II		
Cirque	Pre-Stage I		
Gambier	Pre-Stage I		
Kitsault			
Valley Copper	Stage II		
Western Mines	Stage I		

Table 8 FLOODPLAIN DEVELOPMENT CONTROL: ITEMS DEALT WITH

	1980-81*	1981-82**
1. Zoning By-laws	284	131
2. Official Community and Settlement Plans	116	132
3. By-law Appeals	195	152
4. Subdivisions	824	1107
5. Crown Land Lease and Fee Simple Applications	505	308
6. Flooding Reserve and Ecological Reserve Clearance	123	89

* For 15 month period January 1, 1980 to March 31, 1982
** For 12 month period April 1, 1981 to March 31, 1982

Table 9 FLOODPLAIN MAPPING STATUS: MARCH 1982

ITEM NUMBER	DRAWING NUMBER	PROJECT LOCATION	NUMBER OF MAPPING SHEETS	APPROXIMATE RIVER LENGTH (Kilometer)	COMMENTS
1.	5123	Bella Coola River - Hagensburg	2	11	interim
2.	-	Bulkley River - Smithers, Telkwa, Houston	-	-	profile information only
3.	A5283	Chilliwack River - Vedder Crossing to Slesse Creek	6	20	completed 1981
4.	A5186	Columbia River - Golden	4	17	completed
5.	A5296	Columbia River - Windermere Lake to Radium	9	27	completed
6.	A5286	Columbia River - Columbia Lake to Windermere Lake	6	34	completed 1981
7.	A5291	Coquihalla River - Hope	2	4	interim
8.	5148	Coquitlam River	7	16	completed
9.	A5240	Courtenay River	3	5	completed
10.	5083	Cowichan Lake	4	-	completed
11.	A5293	Cowichan and Koksilah Rivers - Duncan	5	19	completed 1981
12.	-	Deep Creek - Okanagan	4	-	interim
13.	A5187	Eagle River	7	25	completed
14.	A5196	Elk River - Fernie	7	28	completed
15.	A5196	Elk River - Sparwood	2	16	completed
16.	A5175	Fitzsimmons Creek - Whistler	3	3	completed
17.	A5284-P	Fraser and Nechako Rivers - Prince George	1	16	interim, profile information only
18.	5119	Fraser River - Quesnel	1	6	interim
19.	-	Kasio River	-	2	profile information only
20.	5015	Kettle and Granby Rivers - Grand Forks	7	28	interim
21.	A5328	Kitimat River	11	24	completed 1982
22.	A5278	Kootenay River - U.S. Border to Kootenay Lake	6	31	completed 1981
23.	5022-A	Lillooet River - upstream of Lillooet Lake	10	37	completed
24.	-	Mission Creek - Okanagan	-	-	profile information only
25.	5040	Nicola and Coldwater Rivers - Merritt	5	-	completed
26.	-	Okanagan River - Vaseux Lake	-	-	profile information only
27.	-	Powers Creek	-	-	profile information only
28.	A5282	Salmon and White Rivers - Sayward	6	27	completed
29.	A5250	Shawnigan Lake	3	-	completed
30.	A5241	Shuswap River - Mara to Mabel Lakes	17	60	completed
31.	4987	Similkameen River - Border to Princeton	17	96	completed
32.	PR106	Skeena River - Terrace	1	6	interim
33.	-	Skeena River - Hazelton	-	-	interim
34.	A5154	Somass River - Port Alberni	3	8	tsunami hazard
35.	A5199	Squamish River	2	27	interim
36.	A5294	Tulameen River - Coalmont to Tulameen	4	16	completed
37.	5112	Thompson River - Kamloops Area	19	32	completed
38.	5024	Thompson River (North) - Kamloops to Vavenby	28	160	completed
39.	5113	Thompson River (South) - Kamloops to Chase	15	72	completed

TABLE 10

MINOR FLOODING AND EROSION PROJECTS

River Improvement Assistance and Stream Clearing Programs

Year	Requests for Assistance	Site Inspections	Reports Completed	Projects Implemented	
				No.	Total Construction Cost $
1974	115	62	84	54	520,000
1975	93	104	87	24	1,170,000
1976	114	143	112	37	1,043,000
1977	57	86	86	44	499,000
1978	91	95[1]	68[1]	48	463,000
1979	95	105	98	40[2]	490,000
1980	111	90[3]	84	17	580,000
1981	69	79[4]	69[4]	40[4]	430,000[4]

[1] excludes Terrace area flooding investigation and reconstruction.

[2] excludes Mission Creek and Granite Creek projects and Houston dyking for an additional construction value of $1,800,000.

[3] excludes inspection under Provincial Emergency Program following Christmas 1980 storm.

[4] exludes all work associated with the Provincial Emergency Program following the October 1981 storm.

TABLE 11

FRASER RIVER FLOOD CONTROL PROGRAM

EXPENDITURES BY FISCAL YEAR

Fiscal Year	Expenditures			Total
	Design	Construction	Upstream Storage	
1968-1969	$5,165	$120,396	$----	$125,561
1969-1970	658,871	105,464	----	764,335
1970-1971	769,659	1,164,383	3,410	1,937,452
1971-1972	592,110	1,214,645	492,531	2,299,286
1972-1973	650,875	1,456,465	295,618	2,402,958
1973-1974	867,542	4,370,870	64,994	5,303,406
1974-1975	1,173,697	8,849,305	92,062	10,115,064
1975-1976	1,280,582	10,368,685	75,732	11,724,999
1976-1977	919,987	9,020,330	32,066	9,972,383
1977-1978	1,101,902	8,606,174	600	9,708,676
1978-1979	882,251	11,053,066	----	11,935,317
1979-1980	734,857	6,618,397	----	7,353,254
1980-1981	347,030	8,923,818	----	9,270,848
1981-1982 (Estimated)	245,389	8,618,466	----	8,863,855
Total Expenditures to March 31/82	10,117,379	80,602,994	1,057,013	91,777,384

TABLE 12

FRASER RIVER PROGRAM PROJECT STATUS

	Date of Application	Design Per Cent Completed at Year-end	Est. Cost of Construction During 1980-1981 Fiscal Year $	Total Construction To End of Fiscal Year Amount $	Total Construction To End of Fiscal Year Per Cent Completed
Kent	Mar. 5, 1969	100	----	2,666,455	100
Pitt Meadows	Mar. 3, 1969	100	662,714	6,414,373	86
Richmond	Mar. 3, 1969	99	909,701	16,548,273	90
Matsqui	May 15, 1969	100	----	2,547,337	100
Chilliwack	Aug. 1, 1969	90	----	6,402,817	90
Delta	Aug. 1, 1969	98	341,904	13,788,856	90
Mission	Aug. 4, 1969	98	----	----	-
Abbotsford	Feb. 1969	99	5,667,851	11,526,814	48
Surrey-Dams	May 6, 1969	100	----	1,175,254	100
S. Westminster	May 6, 1969	100	6,890	1,828,835	50
New Westminster	Dec. 10, 1970	100	----	3,181,299	100
Coquitlam	Apr. 30, 1970	100	48,534	3,921,886	100
Nicomen Island	Sept. 30, 1974	-	127,039	1,501,456	-
Seabird Island	Oct. 8, 1971	-	----	138,844	-
Vedder River	July 25, 1979	95	632,833	5,642,116	85
Oak Hills	Oct. 28, 1973	100	----	1,051,444	100
Dewdney	Apr. 30, 1973	-	----	9,116	-
Pre-Program Construction			----	211,000	
Administration			220,000	2,046,819	
Totals			8,618,466	80,602,994	

Table 13 - Drainage Studies - Engineering

Area	Description	% Complete to Mar.31/82
A. Undertaken by Water Management Branch		
Surrey	Report on drainage improvements in the Burrows Ditch area on the Nicomekl River floodplain.	100
Delta	Study on proposed drainage improvements in the East Delta area.	75
Mud Bay	Data gathering continued in 1980 for proposed drainage improvements for Mud Bay Dyking District	30
Nicomen Island	Study on proposed drainage imprrovements to Negrin drainge basin, Nicomen Island.	5
B. Undertaken by Consultants		
Pitt Meadows	Study on drainage improvements and replacement of pumping facilities for District of Pitt Meadows.	100
North Cowichan	Report on proposed drainage improvements to Somenos and Richards Creeks.	100
District of Kent	Report on drainage improvements to Miami and Hotspring Sloughs.	100
Matsqui	Report on proposed improvements to Willband and Clayburn Creeks.	100
C. Requests for Studies under Investigation or Awaiting Assignments to Consultants		
Richmond	Preliminary data gathering continued in 1981 and 1982 for proposed drainage improvements and irrigation for the Township of Richmond.	
Port Coquitlam	ARDSA assistance was requested for drainage improvements at Port Coquitlam.	
Chilliwack	A request was received for a study on drainage improvements in the Dunville Creek area, District of Chilliwack.	

TABLE 13 (cont'd.)

Area	Description	% Complete to Mar.31/82
Hope	ARDSA assistance was requested by the Chatathil Farm Cooperative for a feasibility study on drainage improvements.	
Sumas	A request was received for ARDSA assistance to carry out channel improvements in the Sumas Prairie area.	
Chilliwack	ARDSA assistance was requested for drainage improvements in the Everett Ditch area.	
Kent	A request was received for assistance to alleviate flooding by construction of a dam on a backwater of the Fraser River.	
Langley	A request was received for a study on drainage improvements in the Salmon River area.	

Table 14 - Status of Drainage Construction Projects at Year End

PROJECT DESCRIPTION	ARDSA Project No.	DESIGN	CONSTRUCTION		
		% Complete as of Mar.31/82	During Period Apr. 1/81 Mar. 31/82	To Mar.31/82	% Complete as of Mar. 31/82
Pemberton Dyking District Flood Protection and Drainage Scheme.	271105	75	840,979	2,072,500	65
District of Surrey-Old Logging Ditch Drainage Scheme.	271107	100	460,001	460,001	95
Nicomen Island Improvement District - Drainage Scheme.	271110	100	68,756	328,756	100
Glen Valley Dyking District Drainage Scheme.	271114	100	244,759	244,759	100
District of Chilliwack East Chilliwack Drainage.	271120	40	417,849	417,849	30
District of Surrey Burrows Ditch Drainage Scheme.	271131	0	0	0	0
Delta - North Crescent Slough Drainage.	271128	90	164,607	164,607	50
Similkameen Indian Band - Flood Protection Scheme.	271128	95	677,216	677,216	55

Table 15 - Water Supply Studies

Area	Description	% Complete to Mar.31/82
A. Undertaken by Water Management Branch		
Saanich	Study on providing irrigation supplies for ALR lands in Saanich Peninsula.	100
Kersley-Marguerite	Study on proposed irrigation schemes for groups of farmers.	100
Lillooet	Report on development of irrigation water supply for group of landowners on Laluwissin and McGillivray Creeks.	100
Naramata	Report on development of additional storage supply for Naramata Irrigation District.	100
Cultus Lake	Preliminary cost assessment of providing irrigation water supplies for Columbia Valley.	100
Enderby	Report on proposed irrigation scheme for group of farmers at Trinity Valley.	100
Armstrong	Report on irrigation water supply by ALR lands in Municipality of Spallumcheen.	100
Kamloops	Preliminary appraisal of storage possibilities for Upper Louis Creek Stock Association.	100
Lumby	Report on feasibility of development storage sites on Bessette Creek watershed.	100
Vernon	Study on friction losses in Vernon Irrigation District main line and effects of pipe cleaning.	100
Kelowna	Report on extension to Black Mountain Irrigation District system to serve additional land.	70
B. Undertaken by Consultants		
Cranbrook	Report on feasibility of irrigation scheme for group of farmers at Mayook, including investigation into possible supply from City of Cranbrook effluent irrigation project.	100

Table 15 (continued)

Area	Description	% Complete to Mar.31/82
Kelowna	Engineering and economic feasibility study on effluent irrigation system from City of Kelowna for South East Kelowna Irrigation District.	100
Pitt Meadows	Report on feasibility of water supply project for Pitt Meadows and Pitt Polder.	100
Barriere	Report on proposed irrigation system for North Thompson Indian Reserve No. 1.	100
Merritt	Report on reconstruction of Nicola Lake storage dam.	100
C. Request for Studies under Investigation or Awaiting Assignment to Consultants		
Oliver	A request was received from a group of farmers north of Oliver of a study on an irrigation system.	
Grand Forks	ARDSA assistance was requested for a proposed irrigation system on Sutherland Creek.	
Okanagan Falls	A request was received for a study on a proposed irrigation scheme from Shatford Creek.	
Hanceville	A request was received from Stone Indian Band and the Chilko Ranch for assistance to upgrade an existing irrigation system.	
Westwold	ARDSA assistance was requested by the Ingram Creek Water Users' Community for construction of a storage dam.	
Clinton	An application was received from a group of farmers for reconstruction of Leighwood Lake Dam.	

Table 16 - Status of Water Supply Construction Projects

PROJECT DESCRIPTION	ARDSA Project No.	DESIGN	CONSTRUCTION		
		% Complete as of Mar.31/82	During Period Apr. 1/81 Mar. 31/82	To Mar.31/82	% Complete as of Mar. 31/82
McKinney Road W.U.C. Irrigation System	271106	100	92,842	311,218	65
Farleigh Lake Irrigation Scheme	271003 Sub. 2	100	4,505	4,505	100
Big Bar Ranches Irrigation Scheme	271009	100	26,486	185,021	98
O'Connor Lake Dam Irrigation Storage Works	271112	100	94,517	228,385	90
Heffley Irrigation District - Irrigation Storage Works	271117	100	24,216	64,274	80
Paxton Lake Dam Irrigation Storage Works	271115	100	32,821	61,267	90
District of Abbotsford Water Supply System	271297	25	1,870,985	1,870,985	10
Vernon Irrigation District	271124	50	50,823	50,823	10

TABLE 17

COMMUNITY WATER SUPPLIES

Certificates of Public Convenience and Necessity issued between April 1, 1981 and March 31, 1982

Purpose of Certificate	Number issued: Apr.1/81-Mar.31/82	Jan.1/80-Mar.31/81
Construction and operation of new systems	12	12
Construction and operation of extensions to existing systems	44	48
Acquisition of existing systems by new utility owners	13	6
Correction to legal description of waterworks service area	1	1
Change in name of utility	2	1
Consolidation of previously issued Certificates	7	nil
Total Certificates issued	79	68

Table 18 GROUNDWATER QUANTITY

Number of Water Well records Collected, Located and Plotted

Environment Regions	1979-80	1980-81	1981-82
Region # 1 (Vancouver Island)	1138	947	1309
Region # 2 (Lower Mainland)	699	499	396
Region # 3 (Thompson-Nicola)	121	268	259
Region # 4 (Kootenay)	190	147	464
Region # 5 (Cariboo)	390	393	332
Region # 6 (Skeena)	46	97	37
Region # 7 (Omineca-Peace)	313	225	499
Region # 8 (Okanagan)	172	242	274
Totals	3069	2818	3570

	1979-80	1980-81	1981-82
Total Water Wells Field Located	2,130	2,579	1,526
Total Water Wells Plotted on Well Location Maps	2,040	1,880	2,131

Figures for Water Well records collected in 1979-80 have been broken down into approximate regional areas as these statistics were compiled using Land District boundaries prior to the use of the current Environment Regional Area boundaries.

TABLE 19
WATER QUANTITY
GROUNDWATER

Area	Description
Abbotsford	Report completed on construction of standby production well for Fish and Wildlife Branch and BCBC.
Cobble Hill	Assessment in progress of groundwater conditions.
Cobble Hill	Assessment completed of well interference problems.
Computer Processing of Groundwater Data	Design and testing of format for single sheet printouts of individual water well records.
Cowichan Valley - Mill Bay	Advisory assistance provided to Terrestrial Studies Branch on groundwater potential for A.L.R. fine-tuning program.
Cranbrook	Discussions of possible effects of disposal of some industrial wastes on groundwater.
Elko	Review completed of consultant's report on proposed groundwater supply for Public Health Engineering Section.
Ewing Landing	Assessment completed on groundwater - surface water relationships for Okanagan Regional Office.
Galena Bay	Assessment completed of groundwater availability for fish hatchery for Engineering Section.
Galiano Island	Preliminary review in progress of groundwater conditions for Islands Trust.
Hornby Island	Preliminary review in progress of groundwater conditions for Islands Trust.
Kelowna	Assessment completed of groundwater potential for irrigation for Engineering Section.
Kiteley Lake	Review completed of constultant's report on groundwater potential for proposed subdivision for Okanagan Regional Office.
Ladysmith	Assessment completed of groundwater conditions relative to proposed highway widening for Minstry of Transportation and Highways.

Table 19, contd.

Area	Description
Meyer's Flat	Assessment completed of groundwater conditions for Okanagan Regional Office.
Mission Creek	Report completed on relationship between groundwater and surface water for Okanagan Implementation Program.
New Water Well Location Maps	An internal memorandum on the Groundwater Section's base mapping requirements for the production of new water well location maps.
Nicola Basin Strategic Environmental Plan	A short report on occurrence, yield and quality of groundwater for the strategic environmental planning program.
North Thompson Indian Reserve No. 1	Assessment completed on groundwater potential for irrigation for Engineering Section.
Okanagan Basin Waste Disposal Proposal	Review of a proposed groundwater quality monitoring program.
Oliver	Report completed on construction and testing of production wells at B.C. Fruit Grower's Orchard for Engineering Section.
Oyster River	Assessment completed of groundwater prospects for fish hatchery for Fish and Wildlife Branch.
Pender Island	Assessment completed of proposed sewerage disposal application on groundwater for Islands Trust.
Pender Island	Review completed of proposed groundwater development for Islands Trust.
Penticton Indian Reserve	Assessment completed of groundwater potential for irrigation for Engineering Section.
Policy Manual: Groundwater Observation Well Network	A manual outlining the Ministry policy regarding the responsibilities, duties and functions of the Observation Well Network for Victoria and regional offices after decentralization
Policy Manual: Water Well Data Base	A manual outlining Ministry policy responsibilities on functions and duties in water well data base work for Victoria and Regional offices after decentralization.
Procedural Manual: Water Well Record Collection and Processing	A manual explaining collection and processing procedure duties to be performed by Regional office staff after decentralization.

Table 19, contd.

Area	Description
Procedural Manual: For the Regional Field Operations, Maintenance and Data Collection Functions of the Observation Well Network	A manual explaining the field operations, maintenance, and data collection functions of the observation Well Network to be performed by Regional office staff after decentralization.
Procedures for Obtaining Approval of Metal Mine Development	Input concerning groundwater study requirements for the approval process in metal mine development projects.
Province-wide	Discussions concerning proposed legislation for geothermal studies in relation to groundwater.
Province-wide	Memoranda covering consistency in parameters commonly selected for chemical analyses of groundwater samples for drinking water supplies.
Province-wide	Completion of report on Guidelines for Minimum Standards in Water Well Construction for British Columbia for the Water Management Branch, to be published in 1982.
Province-wide	Review of 19 well tests submitted in application for "Certificate of Public Convenience and Necessity" for the Community Water Supply Section.
Province-wide	Report completed on construction of observation well at Williams Lake and observation wells established at Shannon Lake and Sumas Prairie.
Revelstoke	Assessment completed of groundwater conditions relative to basement flooding problem for Engineering Section.
Saanich	Hydrogeological mapping program for the Saanich Penninsula Pilot Project.
Saanich	Collection and laboratory analysis of groundwater samples from selected wells for a sea water encroachment study.
Saanich	An internal memorandum reviewing progress on a research project on the origin and nature of saline groundwaters on the Saanich Penninsula.
Saltspring Island	Review completed of report on water supply for Islands Trust.

Table 19, contd.

Area	Description
Saturna Island	Preliminary review in progress of groundwater conditions for Islands Trust.
Shannon Lake	Review completed of proposed groundwater monitoring program for Okanagan Regional Office.
Spallumcheen	Report completed on groundwater potential for irrigation for Engineering Section.
Trinity Valley	Assessment completed of groundwater potential for irrigation for Engineering Section.
Upper Columbia Strategic Environmental Plan	Completion of a first draft report on occurrence yield and quality of groundwater for the strategic environmental planning program.
Valemount	Assessment completed of water level data and possible effects of raising level of marsh for Omineca-Peace Regional Office.
Vaseaux Creek	Assessment completed of groundwater potential for irrigation for Engineering Section.
Vavenby	Assessment in progress on groundwater potential for water supply for Community Water Supply Section.
Williams Lake	Terms of reference prepared for groundwater study for Town of Williams Lake.

Table 20 SURFACE WATER QUANTITY STUDIES 1981/82

1. WATER SUPPLY

Bowen Island

Streamflow monitoring was completed and preliminary estimates of monthly and annual runoff for a number of potential reservoir sites were updated.

Trinity Creek

Estimates of monthly drought runoff were made to assess the water supply capability for a proposed irrigation system.

Baldy Mountain

Volume runoff estimates were made for a reservoir site proposed for a recreational development.

Trout Creek

A final report was prepared providing water yields for a variety of system operation alternatives based on simulated historical runoff data.

MacKenzie Creek

Monthly flow and flow duration data were determined for assessing the feasibility of a hydro-electric generator at a proposed fish hatchery site.

Naramata Creek

Drought year runoff estimates were made for a number of tributary watersheds being investigated for reservoir storage projects.

Smithers Area Lakes

Estimates of mean and minimum annual inflow to Kathlyn, Seymour, Tyhee and Pound Lakes were provided for assessing lake flushing rates in connection with a water quality study.

Campbell and Quinsam Lakes

Estimates of mean and drought annual inflow for determining lake flushing rates were made for Buttle, Upper Campbell, Lower Campbell, and Middle Quinsam Lakes.

Table 20, contd.

Brannan Lake

Mean annual inflow volume was estimated for input to lake flushing rate studies.

East Vancouver Island

Monthly and annual mean and drought runoff characteristics were estimated by regional analysis for a number of streams in the Mill Bay to Cowichan Bay area. These estimates in conjunction with licensed water use data were used to estimate water availability for selected streams for agricultural land use assessments and general resource planning.

2. FLOOD FLOWS

Peak Flow Regionalization

Updating of flood flow frequency analyses to 1979 was completed and preparation of all data and analyses for each Regional Office was commenced. Peak flows for 25 ungauged streams were estimated for the design of stream crossing structures, floodplain delineation and bank protection works.

October 1981 Stormflow

An analysis of rainfall intensities and resulting stormflow amounts during the October 31 - November 1, 1981 storm on the west coast mainland was commenced.

Colquitz River

Based on streamflow and precipitation data collected in 1979-80, storm hydrographs were analysed and flood flow estimates provided to the District of Saanich.

Lugrin Creek

Flood flow estimates were made based on 1979-80 storm run and precipitation data using unit hydrograph techniques. These estimates were used for floodplain mapping and storm drainage design.

Appendix VII
Surveys and Mapping Program

TABLE 1

SURVEYS & MAPPING:

Photogrammetric Projects Completed in 1981

Project No.	Project Name	Originator	Scale	Vert. Int.	No. of Overlaps
73-017T	Hope-Merritt Addition	Highways**	1" = 400'	5 ft.	3
77-166T/0	Squamish	I & E*	1: 5 000	1 m	34 Orthophotos 102 Contours
79-049T	Edith L. Addition	I & E	1: 2 500	1 m	Existing Models
79-063T	Prince George	I & E	1: 5 000	1 m	364 Bridging Only
79-118T/0	Fairmont-Canal Flats	I & E	1: 5 000	1 m	39 Orthophotos 89 Contours
80-019T/0	Cheakamus Addition	I & E	1: 5 000	1 m & 2 m	1
80-144P/C	Delta, Surrey, Langley	Map Prod.	1: 5 000	-	164
80-145T	Penticton Indian Band	I & E	1: 2 500	.5 m & 1.0 m	34
80-146P	Quatsino	Map Prod.	1:20 000	-	70
80-151T/0	Kelowna-Wood Lake	I & E	1: 5 000	1 m	54
81-009P	Sayward	Map Prod.	1:10 000	-	58
81-017T/C	Williams Lake	Envir.	1: 5 000	2 m	60
81-023P	Vancouver Island	Map Prod.	1:20 000	-	837
81-057T	Kitwanga-Kispiox	B.C. Assess.	1: 5 000	2 m	168 Bridging Only

Projects in Progress March 31, 1982

79-064T/0	Salmon R.	I & E	1: 5 000	1 m	16 Orthophotos 59 Contours
81-024P/C	South Central B.C.	Map Prod.	1:20 000	-	700
81-058T	Fort St. James	I & E	1: 5 000	2 m	68 Orthophotos 68 Contours
81-103T/0	Coldstream	I & E	1: 5 000	1 m	42 Orthophotos 42 Contours
81-104T/0	Vernon-Armstrong	I & E	1: 5 000	1 m	129 Orthophotos 129 Contours

* Inventory and Engineering Branch
** Transportation and Highways

TABLE 2

SURVEYS & MAPPING:

DRAFTING/DERIVED MAPPING

LITHOGRAPHIC MAPS PRINTED APRIL, 1981 TO MARCH, 1982

Map No.	Name	Edition	Scale	Contour Interval (m)	Remarks
82J/NW	Mount Assiniboine	Second	1: 100 000	50	New Map
92K/SW	Campbell River	First	1: 100 000	50	New Map
93B/NE	Narcosli Creek	First	1: 100 000	50	New Map
93B/NW	Nazko River	First	1: 100 000	50	New Map
93B/SE	Williams Lake	First	1: 100 000	50	New Map
93B/SW	Alexis Creek	First	1: 100 000	50	New Map
93L/NE	Fulton River	First	1: 100 000	50	New Map
93L/NW	Telkwa River	First	1: 100 000	50	New Map
93L/SE	Houston	First	1: 100 000	50	New Map
93L/SW	Morice Lake	First	1: 100 000	50	New Map
1 CX	British Columbia	1981	1:3 750 000	50	New Map
1 J	British Columbia	1981	1: 200 000	-	New Map
CR-1	Bowron Lake Park Canoe Route	1981	1: 50 000	50	New Map
PS-B2	Bowron Lake Park	1981	1: 63 360	100 ft.	Partial Revision
1 S	Administrative Boundaries of B.C.	1981	1:5 000 000	-	New Maps

LITHOGRAPHIC MAPS REPRINTED APRIL, 1981 TO MARCH, 1982

82M	Seymour Arm	Second	1: 250 000	500 ft.
82F/NE	Kaslo	Second	1: 125 000	200 ft.
82F/NW	Slocan	Second	1: 125 000	200 ft.
82G/NW	Cranbrook	Second	1: 125 000	200 ft.
82K/SE	Lardeau	Second	1: 125 000	200 ft.
92B/NW-SW	Victoria	Second	1: 125 000	50 m
92J/SE	Pemberton	First	1: 125 000	100 ft.
93A	Quesnel Lake	Second	1: 250 000	500 ft.

continued

TABLE 2 CONT.

LITHOGRAPHIC MAPS REPRINTED APRIL, 1981 TO MARCH, 1982

Map No.	Name	Edition	Scale	Contour Interval (m)
93F	Nechako River	Second	1: 250 000	500 ft.
93H	McBride	Second	1: 250 000	500 ft.
93J	MacLeod Lake	First	1: 250 000	500 ft.
94A	Fort St. John	First	1: 250 000	50
94K	Tuchodi Lakes	First	1: 250 000	150
94O	Maxhamish Lake	First	1: 250 000	50
103I-J	Prince Rupert-Terrace	Third	1: 250 000	150
RH-1	Peace River	First	1: 250 000	150
SGS-1	Vancouver Island	Second	1" = 6 mi.	500 ft. 1000 ft.
1D	Northeastern British Columbia	Third	1: 600 000	-
1EL	Southeastern British Columbia	Third	1: 600 000	-

OTHER PROJECTS

Large Scale	9 projects	392 sheets
Special	8 projects	71 sheets
Orthophoto	7 projects	292 sheets
Federal (N.T.S.)	Admin. Boundaries Revision	129 sheets

TABLE 3

SURVEYS & MAPPING:

CADASTRAL/PLANIMETRIC MAP PRODUCTION - 81/82

Scale	Item	Completed	In Hand
1: 2 500	Cadastral Base	18	-
1: 5 000	Cadastral Base	83	29
1: 5 000	Checking Contract Cadastral	94	-
1:10 000	Planimetric Base	14	-
1:10 000	Integrated Survey Indices	4	1
1:10 000	A.L.R. Constituent Bdy Maps	24	10
1:20 000	Planimetric Base	40	-
1:20 000	Planimetric Revision	334	-
1:20 000	Cadastral Revision	216	48
1:50 000	Cadastral Revision (Federal)	90	-
Various	Grids & Title Blks. (Calcomp Plotter)	908	-

TABLE 4

SURVEYS & MAPPING:

SUMMARY OF PHOTO MOSAICS COMPLETED

Photo/Mosaic Number		Number of sheets	Originator	Scale
467-79	Princeton Area-Similkameen R	1	Forests	1:20 000
468-79	Princeton Area-Tulameen	1	Forests	1:20 000
469-79	Princeton Area-Allenby	1	Forests	1:20 000
470-79	Princeton Area-Summers Cr.	2	Forests	1:20 000
471-79	Princeton Area-Hayes Cr.	2	Forests	1:50 000
472-78	Stein River	2	Forests	1:50 000
473-80	Sorrento Area	1	Trans. & Highways	1:20 000
474-79	Fort Steele-Cranbrook	1	Forests	1:20 000
475.77	700 Road to Genevieve Lk.	1	Forests	1:20 000
476-77	Galt Creek	1	Forests	1:20 000
477-77	Stone Creek	1	Forests	1:20 000
478-77	Trapping Lake	1	Forests	1:20 000
479-77	Hixon Basin	1	Forests	1:20 000
480-77	Terry Cr-Yardley Lk.	2	Forests	1:20 000
481-79	Colvalli North	1	Forests	1:20 000
482-79	Peckhams Lake	1	Forests	1:20 000
483-80	Hazelton Area	2	Municipal Affairs	1:20 000
484-79	Cherry-Ta Ta Cr.	1	Forests	1:20 000
485-79	Pickering Hills	1	Forests	1:20 000
486-79	Burton Lake	1	Forests	1:20 000
487-79	Newgate Range Unit	1	Forests	1:20 000
488-79	Waldo Range Unit	2	Forests	1:20 000
489-79	St. Mary's Prairie	1	Forests	1:20 000
490-79	Gold Cr.-Plumbob Cr.	3	Forests	1:20 000
491-80	Monte Lake	1	Lands, Parks & Housing	1:20 000
492-79	Wildhorse Cr.-Lewis Cr.	1	Forests	1:20 000
493-79	Grasmere Range Unit	2	Forests	1:20 000
494-80	Kamloops Lk. North	5	Lands, Parks & Housing	1:20 000
495-75	Willies Hump	1	Forests	1:15 840
496-80	Tagai Burn	1	Forests	1:15 840
497-75	Lynx Lake	1	Forests	1:15 840
498-81	Pitt Wildlife Manag. Area	2	Fish and Wildlife	1:10 000
499-79	Gold Cr. Extension	5	Forests	1:20 000
500-75	Truax Cr.	1	Forests	1:20 000
501-80	Langley-Harrison	2	Trans. & Highways	1:50 000
502-81	Squamish-Cheekye	2	Trans. & Highways	1:10 000
503-81	Fort St. John	2	Trans. & Highways	1:20 000
504-79	Lodestone Mountain	1	Forests	1:40 000
505-81	Lumby Village Municipality	1	Trans. & Highways	1: 7 500
506-75	West Pavilion	2	Forests	1:31 680

continued

TABLE 4 CONT.

SUMMARY OF PHOTO MOSAICS COMPLETED

Photo/Mosaic Number		Number of sheets	Originator	Scale
507-80	Port Nelson Area	2	Municipal Affairs	1:20 000
508-76	Maiden Creek	1	Forests	1:20 000
509-81	Mackenzie Dist. Municipality	1	Trans. & Highways	1:20 000
510-79	Trophy Mountain	1	Forests	1:40 000
511-81	Port McNeill	4	Trans. & Highways	1:10 000
512-79	D'Arcy Mountain	2	Forests	1:40 000
513-79	Flathead River	3	Forests	1:40 000
514-77	Westfire Community Pasture	1	Forests	1:20 000
515-78	Winfield to Oyama	2	Trans. & Highways	1:10 000
516-79	Grand Forks A.L.R.	1	Agric. Land Comm.	1:20 000
517-81	Meares Island	1	Forests	1:20 000
518-81	100 Mile House	1	Trans. & Highways	1: 8 000
519-80	Village of Lake Cowichan	1	Trans. & Highways	1:10 000
520-80	Lytton Area	1	Forests	1:20 000
521-78	Telkwa	1	Trans. & Highways	1:15 000
522-79	Stone C.R.M.P.	2	Forests	1:40 000
523-79	Pelican Lake C.R.M.P.	2	Forests	1:40 000
524-81	Armstrong	1	Trans. & Highways	1: 7 500
525-81	Enderby	1	Trans. & Highways	1: 7 500
526-81	Ladysmith Hartour	1	Environment	1:10 000
527-81	Kamloops Area	3	Trans. & Highways	1:10 000

TABLE 5/SURVEYS & MAPPING: REPROGRAPHICS 1981-82

	AIR PHOTO SECTION							REPRODUCTION SECTION					
	REQS.	10x10	DIAPS.	ENLGS.	MOSAICS	COLOR	COST	REQS.	IMPRTS.	OFFSET	PHOTO	COST	TOTAL COST
AGRICULTURE	143	2,665	48	98	64	39	1,943.22	155	2,993		65	1,493.00	3,436.22
ATTORNEY-GENERAL	5			14			40.00	14	164		121	165.41	205.51
CONSUMER & CORPORATE AFFAIRS	3	9					4.14	2	2			.78	4.92
EDUCATION	2	31					14.26	7	2		19	91.59	105.85
ENERGY, MINES & PETROLEUM RESOURCES	73	4,194		86		82	4,579.75	941	20,524		2,137	10,620.38	15,200.13
ENVIRONMENT	982	107,548	2,121	681	97	7298	57,992.07	6,210	56,750	3,462,198	27,144	124301.70	182,293.77
FINANCE	8	5		3	10		80.53	9	63		4	32.67	113.20
FORESTS	659	102,352	41	289	44	6964	64,102.06	1,344	6,470	100	11,596	56,864.23	120,966.29
HEALTH	5			5	3		36.48	94	606		11,387	4,645.73	4,682.21
HUMAN RESOURCES								303	121		1,048	1,968.27	1,998.27
INDUSTRY & SMALL BUSINESS DEVELOPMENT	1	5		4			2.30	6	10		8	49.20	51.50
LABOUR													
LANDS, PARKS & HOUSING													
Lands Management/Legal Surveys	222	18,488		65	17	698	9,241.34	2,887	25,298	78	1,604	13,330.96	22,572.30
Parks	124	9,086		30	11	73	4,392.76	396	1,058	90	5,147	5,982.58	10,375.34
Housing	14	83		11			88.50	46	516		37	230.67	319.17
LEGISLATIVE ASSEMBLY	3	105					40.30	8	48			38.80	87.10
MUNICIPAL AFFAIRS	24	1,023		14		10	586.72	813	8,313		1,655	9,746.32	10,333.04
PROVINCIAL SECRETARY & GOV'T. SERVICES	76	675	6	49	1	7	445.77	428	2,724		3,259	5,396.24	5,842.01
TOURISM	1	27					12.48	2			14	19.90	32.37
TRANSPORTATION & HIGHWAYS	629	33,770	33	136	42	237	16,890.31	2,132	92,741	1,500	18,490	36,705.42	53,595.73
UNIVERSITIES, SCIENCE & COMMUNICATIONS	7	-		13	4		61.48	38	312		1	72.83	134.31
B. C. ASSESSMENT AUTHORITY	111	6,182		498	8	57	19,446.66	90	1,747		94	5,466.00	24,911.66
PUBLIC	4,922	118,279	7,092	2,026	307	3385	203238.89	1,916	14,532	7,404	11,127	82,503.51	286,742.46
THESE COSTS ARE FOR MATERIALS ONLY EXCEPT FOR PUBLIC AND B.C. ASSESSMENT WHICH INCLUDE A LABOUR CHARGE.													
TOTAL	7,914	404,527	9,341	4,018	608	18,850	483218.06	17,941	234,904	3,471,330	95,757	329,725.28	812,943.34

TABLE 6

SURVEYS & MAPPING:

1981 FIELD SEASON

FIELD SURVEY ACCOMPLISHMENTS

PROJECT NAME

REQUESTING AGENCY	MAP SHEETS CONTROLLED	HORIZ. CONT. MONUMENTS	VERT. CONT. POINTS	BENCH MARKS	1:5 000 MAPPING CONTROL	CADASTRAL TIES
Lower Fraser Valley 92G, 92H	170(Full) 28(Require Photography)	88	109		X	33
Alberni-Parksville 92F, 92G	88 47(Partially)	85	100		X	
Hazelton-Kispiox 93M-103P	56 3(Require Photography)	5			X	63
Western Communities 92B					X	2

INTEGRATED SURVEY SYSTEMS

CONTROL MONUMENTS SURVEYED

Saanich	134
Kamloops	249
Rossland	48
Nanaimo	44
Vancouver	230
	705

RECONNAISSANCE INTEGRATED SURVEYS

	MONUMENT LOCATIONS
Kamloops	200
Dawson Creek	7
Logan Lake	55
	262

CHECK INTEGRATED SURVEYS (FOR MONUMENT MOVEMENT)

	MONUMENTS OCCUPIED
Vernon	31

STANDARDIZATION BASES ESTABLISHED

Duncan — 1 Base Established

TABLE 7

SURVEYS & MAPPING:

1981 PHOTOGRAPHIC BREAKDOWN

	Number of Photos	Line Kilometres	Flying Time Hours
I. R. False Colour	607	1,137	11.5
Colour Negative	4,670	5,513	67.5
Panchromatic	31,610	40,876	524.1
TOTAL:	36,887	47,526	603.1

TABLE 8

SURVEYS & MAPPING:

1981 PHOTOGRAPHIC ACCOMPLISHMENT

	Flying Time Hours	Number of Photos	Line Kilometres
B. C. Assessment Authority	22.3	1,243	1,269
B. C. Ferry Authority	2.3	3	2
B. C. Hydro	6.3	78	48
Government of Canada	.6	22	18
Ministry of Energy, Mines and Petroleum Resources	1.4	48	77
Ministry of Environment	182.7	7,477	6,342
Ministry of Forests	233.4	18,327	30,114
Ministry of Lands, Parks and Housing	96.8	6,686	7,604
Ministry of Provincial Secretary	.2	3	2
Ministry of Transportation and Highways	44.7	2,364	1,356
Regional Districts	12.4	636	694
TOTAL:	603.1	36,887	47,526

TABLE 9

SURVEYS & MAPPING:

CONTRACT MAPPING 1981-82

Treasury Board No.	Project	Contractor	Cost-Share
Carry Overs From 1980-81			
45-81	Quesnel		
53-81	Queen Charlotte Islands	Burnett	
87-81	Western Communities	McElhanney	Cap. Reg. Dist.
1981-82 Projects			
18-82	Vernon	Vernon	Vernon
Ministerial Submission	Spallumcheen	R.D. of N. Okanagan	R.D. of N. Okanagan
16-82	Burnaby Contours	Burnaby	Burnaby
8-82	Burnaby Cadastral	Burnaby	
54-82	Parksville-Qualicum	Burnett	
32-82	Hazelton-Kitwanga	Burnett	R.D. of Kitimat-Stikine
44-82	Prince George	McElhanney	
TB Pre-Approved	Port Moody	Port Moody	Port Moody
TB Pre-Approved	Matsqui	Matsqui	Matsqui
TB Pre-Approved	Langley	Langley Township	Langley Township
TB Pre-Approved	Mission	Mission	Mission
49-82	Rossland-Trail	McElhanney	Trail; R.D. of Kootenay-Bd
34-82	Tumbler Ridge	Underhill	
Ministerial Submission	B.C./Alta. Boundary	Underhill	Prov. of Alberta
TB Pre-Approved	Vancouver Integrated Survey	McElhanney	Vancouver
Ministerial Submission	1982-83 Base Mapping Program Book	Custom Drafting Ltd.	
Ministerial Submission	Trail Cadastral Extension	McElhanney	Trail
Ministerial Submission	View Royal	Integrated Resources	
Ministerial Submission	Genoa Bay	Aerogeometric	
88-82	Vancouver Cadastral Mapping	Vancouver	Vancouver
Ministerial Submission	Small Scale Control Transfer	McElhanney	

TABLE 10

SURVEYS & MAPPING:

MAPS-B.C. MAP AND AIR PHOTO DISTRIBUTION

	Lithographed Maps			Itek	
	Number of Requisitions	Number of Maps	Value $	Number	Value $
Environment					
Surveys & Mapping Br.	213	6,093	15,065.75	175	350.00
Inventory & Eng. Br.	68	527	1,400.25	74	148.00
Prov. Emergency Prog.	53	1,329	3,434.75	4	8.00
Fish & Wildlife Br.	177	2,417	6,258.75	55	110.00
Marine Resources Br.	11	112	235.50	23	46.00
Water Management Br.	216	1,437	3,521.25	618	1,236.00
Waste Mangement Br.	43	389	1,009.00	1	2.00
Assessment & Planning Div.	195	2,377	5,871.75	862	1,724.00
Regional Operations Div.	15	90	237.50	8	16.00
Agriculture	49	553	1,376.25	16	32.00
Attorney-General	35	275	736.00	1	2.00
Consumer and Corporate Affairs	5	11	30.50		
Education	50	980	2,512.00	3	6.00
Energy, Mines & Pet. Resources	279	1,749	4,452.75	12	24.00
Finance	14	107	272.50		
Forests	506	16,027	41,686.55	530	1,060.00
Health	27	693	1,801.75		
Human Resources	11	01	186.00		
Industry & Sm. Business Devel.	16	88	287.50	12	24.00
Labour	11	71	94.50		
Lands, Parks & Housing					
Lands	152	2,053	4,651.35	375	750.00
Parks	144	2,894	8,099.95	51	102.00
Housing	27	176	360.00	23	46.00
Municipal Affairs	26	122	310.00		
Prov. Sect'y & Gov't Services	155	2,379	5,694.75	59	118.00
Tourism	17	109	286.50		
Transportation & Highways	399	3,589	9,218.75	614	1,228.00
Universities, Science & Comm.	9	1,111	2,682.00		
Government Total	2,923	47,859	121,774.10	3,516	7,032.00
Public	6,750	128,650	371,763.00	3,716	7,432.00
Total	9,673	176,509	493,537.10	7,232	14,464.00

Mail Count 9,228

Cash Customers 7,267

Cash Collected $91,939.03
(through cash register)

The Ministry of Environment Annual Report 1981/82 has been prepared in this format to reflect current restraints on publication costs, and printing has been limited to 300 copies.

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